THE
ELECTRICAL REVIEW

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The Export Position

Vital Importance of Overseas Trade

MODERN warfare demands for its successful prosecution the concentration of the whole of the resources of a nation upon that one aim. But this does not mean that the production of munitions of war is the sole consideration. A country like Great Britain has to ensure continuance of essential supplies from overseas, and while payment for these can be made in several ways, one of the most important is by the counterbalancing of imports by exports as far as possible. This need is accentuated by the difficulties of providing the "invisible" exports (shipping, services, etc.) which help to square the account in peacetime.

The stoppage of German electrical exports to a number of important markets should not merely be allowed to bring advantage to neutrals. The United States naturally hopes to capture a large share of former German trade, particularly in Latin America, and there is no reason why she should not. But the large volume of our imports from South America demands that we should export as much as we can to those countries.

The importance of maintaining export trade is fully recognised by the Government. In a recent memorandum to trade organisations the President of the Board of Trade (Mr. Oliver Stanley) said that it was essential in the national interest that traders should be encouraged to maintain and increase their export trade to the greatest extent, consistent with vital war needs, and the Government was anxious to assist them in every possible way.

Supplies of Materials

The obtaining of the necessary supplies of materials is naturally the principal obstacle to production at the moment. A substantial proportion of materials used in electrical manufacturing has to be imported, but apart from this much of those materials is of the kind required for munitions of war.

The Presidents statement dealt with this point: it was considered that "as regards controlled materials there should in most cases be no difficulty in obtaining the supplies necessary for manufacture for export, and it should only be in exceptional cases that there is insufficient for export needs." It was also stated that supplies of materials for the production of the goods normally exported could, so far as could be foreseen, be safely relied upon for a period of three months at least.

Export control has introduced complications in the initial stages, but we are assured that difficulties in this direction are rapidly being smoothed out. A great deal of the trouble was due to misinformed traders who laboured under the misapprehension that licences were needed for every form of export. So far as electrical manufacturers are concerned the only classes of goods involved are generators, transformers, switchgear, magnetos, radio transmitting valves, electric discharge tubes, carbons and X-ray tubes.

Such plant as motors and control gear and converting machinery is not subject to licence, and these types of equipment represented the greater part of our electrical machinery exports last year. Taking the published figures for 1938 we find that of the total value of electrical equipment exported (£21,647,000) only goods and machinery valued at between four and five million sterling were of the classes now subject to export control.

Control Position Easing

Procedure for the issue of licences for controlled exports has been greatly accelerated, and Mr. Stanley stated that the issue of general licences had been increased, and they would be granted whenever practicable. Existing and future contracts for capital goods which take a considerable time to fulfil (we presume that this applies to large electrical plant) are to receive special consideration with a view to arrangements being made for the supply of materials and the issue of export licences.

It will be seen, therefore, that provided the supplies of materials can be maintained, and so far as war demands permit, there is ample scope for holding on to much of our electrical export trade. That trade, built up so laboriously during the past twenty years, must not be allowed to go by default. We are not shutting our eyes to the extremely severe handicaps which have to be surmounted, but we have sufficient faith in the inherent strength of our electrical manufacturing industry to feel sure of the preservation of a substantial proportion of the trade with the assurance that the Government will abide by its declared intention to foster and encourage export business.

The Rationing Scheme.

THE decision of the Government to allow consumers of electricity and gas the same amount as in the corresponding quarters of the year ended June 30th last is a triumph of common sense over hasty bureaucracy. It was evident from the first that any advantage to the community resulting from the one-sided regulations contained in the Fuel and Lighting Order would be nullified by the difficulty of enforcement and unnecessary inconvenience to the consumer. It is intended to retain the rather elaborate organisation set up to administer the Order to prevent excessive consumption and to secure a reduction if it becomes necessary at a later stage. The reason given for the decision is a somewhat ingenuous one—that the necessary saving has been effected by the "black out." The Electricity Commissioners' returns for 1937-38 showed that 7,348.5 million kWh was sold for lighting, heating and cooking, while public lighting accounted for 341.1 million kWh; but no doubt there has been a considerable saving in shop-window lighting and signs. The real reason, of course, was that the scheme was found to be inequitable and impracticable, and its amendment was virtually a foregone conclusion. In last week's leading article we expressed a doubt whether the electricity supply industry was consulted before the Order was drawn up. It is definitely stated in the October "Journal" of the I.M.E.A. that that Association was not approached.

Keeping in Touch

IN its October issue the "Journal" of the I.M.E.A. states that it intends to carry on as long as possible although the current number is said to have been published under great difficulties. While sympathising with the "Journal," we feel bound to remark that if such difficulties prevent information getting to members in reasonable time the ELECTRICAL REVIEW is always at the Association's service. The matter goes further than this. The doings of the I.M.E.A. are of interest and importance to all other sections of the electrical industry, and it is only through the electrical Press that they can be kept in touch with each other. The same considerations apply, of course, to all the other electrical associations. We notice in the October number of the journal of the Electrical Power Engineers' Association a statement regarding its future in which it is said that "the journal may prove to be the only reliable means of keeping the members in touch with the Association's affairs." This is a slight upon the electrical Press, though no doubt an unintentional one. If, unfortunately, association organs find it necessary to suspend publication we hope to continue to fulfil and intensify one of our most important functions which is to maintain a liaison between the units of the electrical industry and between the members of those units.

Railway Safety

ONE sometimes hears admiration for the electrified sections of our railways qualified by questionings as to their vulnerability in time of war. Those suffering from qualms of this kind should be referred to a statement made within the past twelve months by the Chief Electrical Engineer of the L. & N.E.R. at an I.E.E. meeting at Liverpool. Pointing out that railways which depended upon electricity from interlinked power stations would be quite as well off as other users of electricity, Mr. H. W. H. Richards said that past experience with the maintenance of overhead-line equipment on the suburban lines of the old London, Brighton and South Coast Railway running into two important terminal stations—London Bridge and Victoria—indicated that in the event of accidents or the carrying out of civil engineering work, such as the replacement of steel bridges, very little time was required for dealing with alterations to the overhead-line equipment. He believed that if an aerial attack resulted in damage to a railway line, the delay would not be materially increased if electric traction were more widely used. He did, however, advocate the maintaining of self-contained locomotives for dealing with possible wartime conditions. Actually, miles of exposed track presented a far more likely target, and the source of locomotive power would not affect the position.

Bradford Jubilee

WHEN, in 1914, Bradford Corporation's electricity undertaking reached its silver jubilee this country had just become involved in the "war to end war." Now, again, the undertaking's jubilee is overshadowed by the commencement of a conflict which prevents the due celebration of an occasion of special interest, for the Corporation claims to have been the first local authority in the world to give a public supply of electricity, commencing in the central portion of what was then the borough of Bradford on September 20th, 1889. In the past year the revenue of the undertaking, under Mr. Thomas Roles's management, for the first time exceeded that of any other trading department of the Corporation—the gas undertaking is municipally owned—and looking to the time, not far off it is hoped, when peace will again prevail, the Electricity Committee confidently anticipates further healthy expansion of the undertaking's business, for it sees no sign whatever that anything approaching saturation point has yet been reached. One fact made abundantly clear by the rationing scheme is that, under modern conditions of living, the use of electricity has become so essential that its restriction causes hardship, and in years to come this will be true to an even greater extent.

Transport in Wartime

A WEEK or two ago we made reference to the decision of the Liverpool and Darwin Corporations to retain tramways which were being superseded by motor-bus services and the Manchester Transport Committee's promise to consider a similar proposal. Among the latest to be persuaded by the present situation to the same way of thinking are Leicester, Bristol and Blackburn. The London Passenger Transport Board has also shown that electric traction is most desirable in view of the necessity to conserve petrol. In announcing the recent restrictions of its bus services it stated that full services were being operated by the trams and trolley-buses as these vehicles depended entirely upon energy from home-produced coal. Recently the Belfast Corporation debated the matter of local transport and decided to continue with its extension of the trolley-bus system to the east of the city. France, too, is following suit, as witnesses the decision to install trolley-buses in Limoges.

Military Service

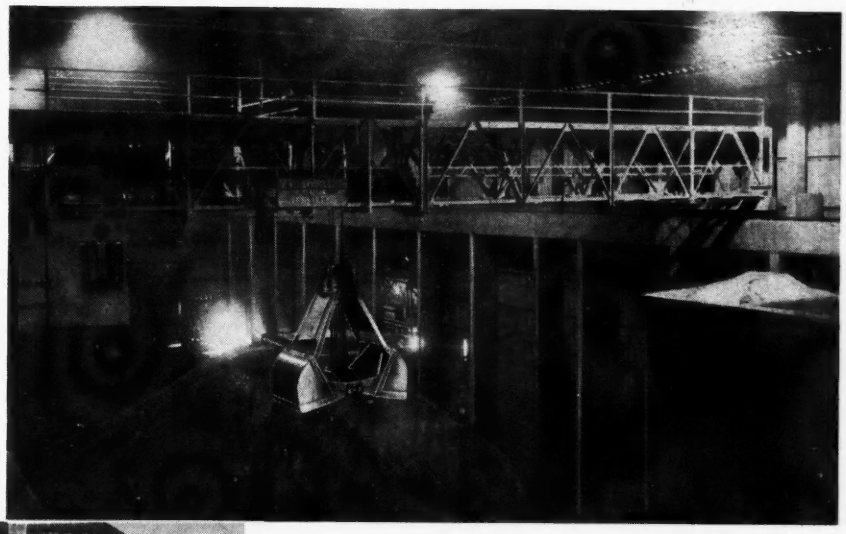
LACK of public recognition of the value of the engineer's work for the community was a cause of much waste of skill and experience in the last war that must have detracted appreciably from this country's resources. This time the same mistake will not be made. As a result of the initiative of the leading institutions, those members who are called up for service with the armed forces will be posted to units in which their training can be most effectively employed. Neither has the future been lost sight of, as graduates and students are to be assigned to duties offering experience that is likely to be most useful on return to civil life. Electrical men should take care to inform interviewing officers that they are members of the I.E.E. and are recommended to apply previously to the secretary for documentary evidence of membership. Members, even if carrying on their own work is the best contribution they can make to national service, should nevertheless fill in the I.E.E. registration forms as soon as possible. In any case, the red form should be returned in order that the Institution's records may be complete. On parallel lines are the arrangements that have been made, as mentioned elsewhere in this issue, for enabling the services of the most suitable engineers to be engaged in the manufacture of the means for carrying on mechanised warfare.

ELECTRICITY IN CEMENT MAKING

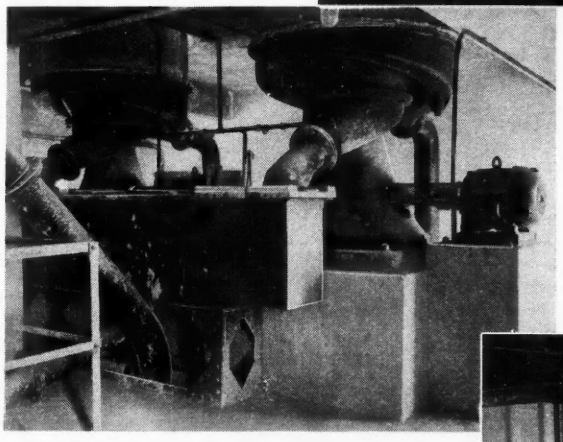
Installation at a New Works

ALTHOUGH the Rugby Portland Cement Co., Ltd., built its new cement works at Halling, Rochester, and for the main part on an entirely new site adjoining the old works of Albert Batchelor, Ltd., which it had previously acquired, it constructed the packing and storage departments on the old works site because of the greater facilities for transportation afforded by the nearby River Medway and the Southern Railway. Both public supply and private generation of electricity were considered, but the company came to terms with the Kent Electric Power Co. and energy is now supplied to the works at 11 kV by two cables (0.1 sq. in. and 0.075 sq. in.) from the Holborough sub-station.

There are two systems of transformation direct from 11 kV. The 1,400-kVA, 11,000/3,300-V B.T.H. and the 600-kVA, 11,000/440-V Hackbridge transformers are delta-star wound and connected between the appropriate components of an 11-kV, metal-clad compound-filled switchboard (Switchgear and Cowans), a 3.3-kV metal-clad compound Reyrolle board and a 440-V metal-clad Reyrolle board equipped with air-insulated bus-bars. The circuit-breakers of the 11-kV, 3.3-kV and 440-V boards have rupturing capacities of 100,000 kVA, 75,000 kVA and 25,000 kVA respectively.



Section of the large storage gantry showing overhead grabbing crane

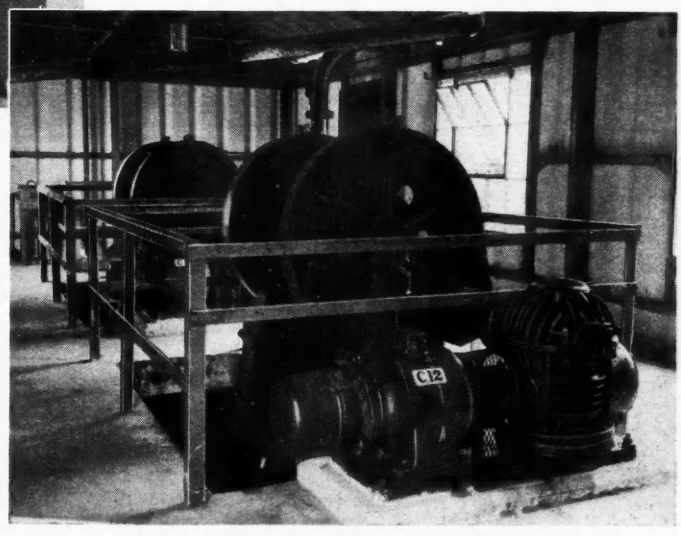


Part of the Trix separators and their drives

The 11/3.3-kV and the 11-kV/440-V transformers are each fitted with manually operated off-load tap-changing gear. The 3.3-kV system has overload and restricted earth leakage protection, so arranged that should a fault occur on the 1,400-kVA transformer the main incoming circuit-breaker on the 3.3-kV board would trip as well as the 11-kV circuit-breaker controlling the transformer, whilst individual outgoing feeder switches are each provided with their own sensitive protection. The 600-kVA transformer on the 440-V system is similarly protected but here the scheme provides for an audible warning to be given and registration of the fault current should this not exceed 45 A. Should the earth current exceed 45 A, however, tripping would take place as with the other scheme. This ensures that kilns for which continuous running is essential are not shut down unnecessarily by small earth faults.

Metering is effected at e.h.v., the 11-kV switchboard being equipped with a metering panel with three meters —one owned by the Cement Co., one by the supply undertaking and one jointly. Each meter is fitted with a maximum demand indicator with half-hour integration. All the works feeder panels are fitted with watt-hour meters for weekly costing.

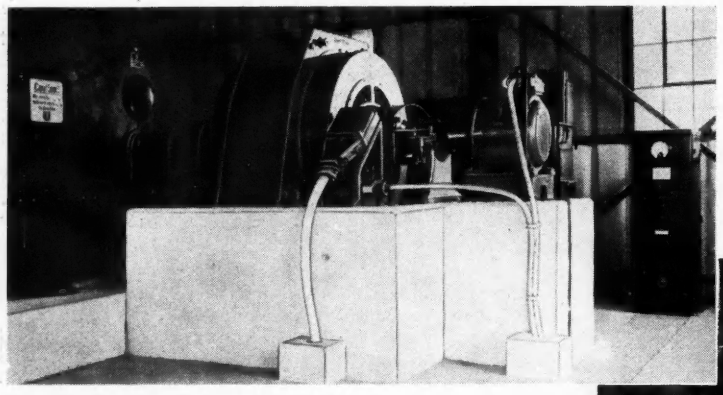
The whole of the equipment described in the foregoing notes is laid out impressively in a very large brick and steel sub-station with modern means of fire protection such as short brick walls around the transformers for oil collection, brick bushing around the cables at the floor and pebble-filled cable trenches.



Two slurry pumps driven by 10-HP motors

On the basis of the present one-unit layout of the cement production plant, the probable consumption will be about 6½ million kWh per year with a maximum demand of, say, 1,200 kW. The total horse-power of the seventy motors installed is 2,450 and all of them were supplied by the British Thomson-Houston Co., Ltd. Motors of over 125 HP are operated at 3.3 kV and smaller units at 440 V. Power factor correction to practically unity for the whole installation is effected by means of synchronous motor drives for the mills. The 3.3-kV mill motors have oil circuit-breaker stator controls of 75,000 kVA rupturing capacity with liquid starters rated at 4,000 HP-minutes and downwards for the motor circuits.

For the protection of the oil-immersed reduction gears of the cement mill electrical contacts are fitted at various parts of the gears and so arranged that



Cement mill drive; 785-HP, 3.3-kV synchronous motor and single reduction gear (left); oil circuit-breaker control (right)

should the gearing come out of alignment either axially or radially the circuit-breaker of the motor would trip by the operation of the no-volt release coil. Most of the smaller motors are squirrel-cage machines controlled by either B.T.H. oil circuit-breaker units or Brookhirst contactor panels. The constant-speed slip-ring induction motors have B.T.H. oil circuit-breaker rotor starter controls whilst Brookhirst contactors are employed for constant- or variable-speed motors.

Most of the auxiliaries in the cement mill department are controlled by starters interlocked for sequence operation to avoid blocking-up of the material on the flow system. Similar interlocking systems are provided in the coal mill and packing plant departments. For variable-speed drives above 5 HP, AC commutator motors and slip-ring induction motors with rotor resistance regulation are employed, but on the score of economy in initial cost variable-speed drives of up to 5 HP employ DC motors which are supplied by a 15-kW motor-generator set in the main sub-station.

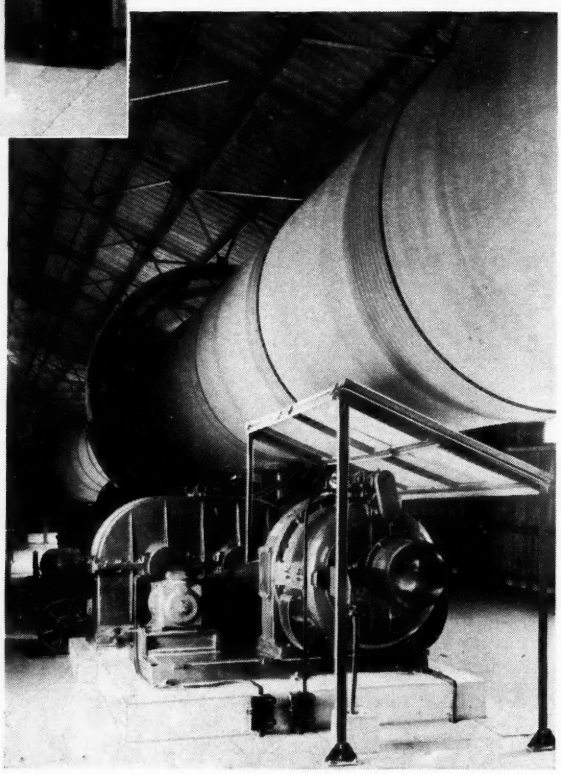
We were impressed by the neatness and accessibility of the general installation layout. From the feeder panels in the main sub-station underground cables are run to various ironclad fuse boards with English Electric high-rupturing capacity cartridge fuses for local distribution. No motor in the whole installation is switched directly on the feeders. Lead-covered paper-insulated cable is used throughout all circuits for all motors above 50 HP, but for motors smaller than this p.i.l.c. cables are used up to the starter, the circuit to the motor being continued with v.i.r. cable in screwed conduit.

Affording a supply to the 440-V motors installed at the packing plant and at the coal-handling plant a 3.3-kV cable is run from the main sub-station to a secondary sub-station where the energy is stepped down to 440 V by a 100-kVA transformer. At this point we noticed a 60-kW B.T.H. glass-bulb rectifier supplying some of the auxiliary drives at the old works which are still used at times of heavy demand.

The lighting system throughout is at 110 V, phase to neutral, secondary transformation being provided locally for different sections of the works. A typical lighting distribution point is that in the sub-station where a 25-kVA, 440/190-V transformer serves a distribution board with three Simplex d.p. switch-fuses, one operating independently on each phase. Similar lighting distribution points are at the burner's platform, the old works and the packing plant.

The raw materials which go to the manufacture of "Crown" and "Crowncrete" cement are clay and chalk, the chalk being obtained from an adjacent quarry and the clay from a pit three miles away. Diesel excavators are employed for the removal of the chalk at the quarry where there is a pumping station supplying water from the quarry pool for works processes. This pumping station is equipped with two 10,000-gal. per hour pumps, each driven by a 20-HP motor. The water is pumped to a tank at the top of the raw-mill building, 2,100 ft. away, the pumps being controlled by starters situated at the burner's platform 1,800 ft. from the pumps. By means of floats high and low levels are recorded electrically.

The chalk from the quarries is hauled to the works in narrow-gauge wagons by Diesel locos and is tipped into a hopper feeding a belt conveyor, driven by a 10-HP motor through suitable reduction gearing, at the designed rate of 100 tons



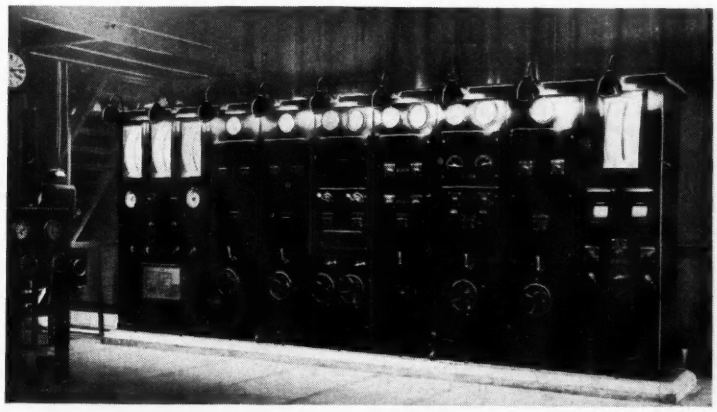
Main kiln drive (90 HP AC commutator motor 760/190 RPM) and small alternator supplying the kiln feeding motor

per hour. This belt deposits the chalk into a large storage gantry which is spanned by an Arrol 10-ton travelling crane. The clay is also tipped into the storage gantry direct by lorries. Chalk, clay, clinker, coal and gypsum are all housed in the huge storage gantry.

As required, chalk and clay are removed from storage by the grab of the gantry crane and deposited in a hopper within the storage gantry from which the chalk and clay, together with water, which is sprayed into the hopper, are fed to a large wash mill of the chain and harrow type which is driven by a 250-HP slip-ring motor. This runs at 735 RPM which speed is first reduced in a single-reduction unit (Northern Manufacturing Co., Ltd.), giving a horizontal-shaft transmission at 86 RPM which is further reduced by open spur and

pinion transmission to give a final speed at the vertical wheel shaft of about 10 RPM.

In the wash mill the soft slurry is thrown outwards by centrifugal force through vertical screens to a trench round the periphery of the mill and from this it flows by another trench to the bottom of a couple of vertical bucket elevators in the raw-mill building. The mixture is taken immediately to near the top of this building where it is "split" to flow downwards in sequence through a series of "Trix" centrifugal separators arranged vertically throughout four floors of the structure. There are five Trixes, two coarse machines at the top and three fine machines. In each machine the finer material is forced by centrifugal action through a screen around the container. The rejects from the coarse Trixes are fed back to the wash mill and those from the fine machines are fed to a tubular ball grinding mill. The finished slurry is fed to a storage basin. The coarse and fine Trixes are individually driven by 15-HP and 10-HP motors, respectively, with speed decrease by worm gearing from 1,465 RPM to 300 RPM. The ball mill is driven by a 175-HP, 3.3-kV synchronous induction motor with a speed reduction from 750 RPM to 22 RPM.

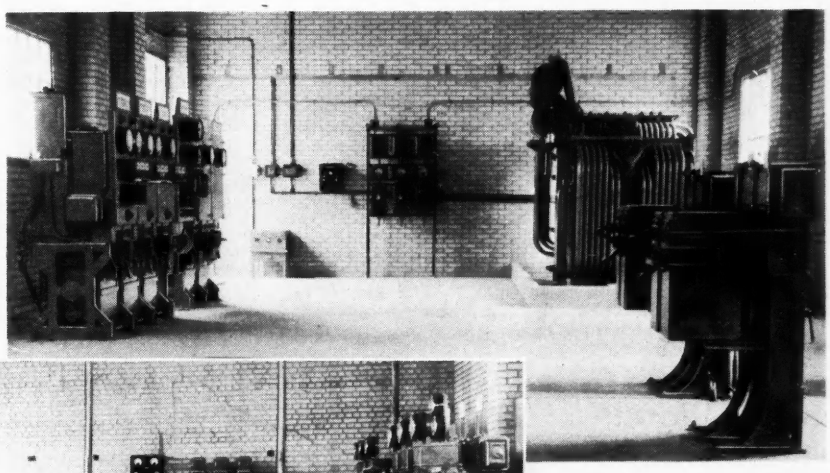


Centralised kiln control board at burner's platform

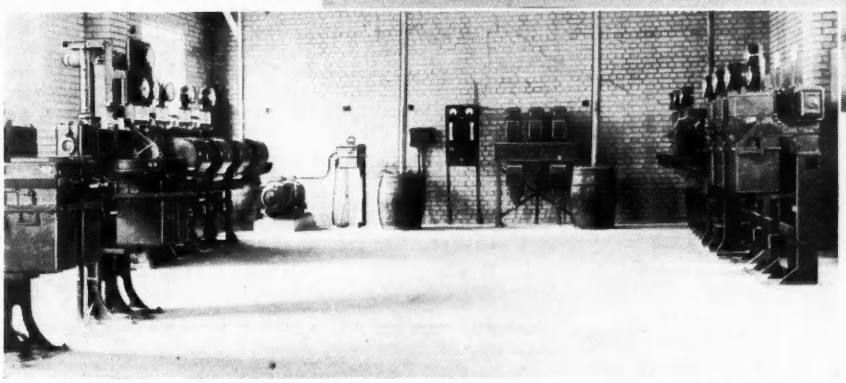
In the 1,500-cu. yd. sun-and-planet storage basin the slurry is kept agitated by both mechanical means and compressed air. A huge lattice arm spans the 66-ft. diameter basin and revolves about its centre where, at the top, is the driving-motor house. As this is itself on the move during operations a slip-ring feed to the motor is necessary. This is arranged on the stationary column support under the motor house. The 20-HP motor drives, through worm reduction gear, horizontal shafts running outwards along the main arm in either direction. On either side there are two right-angle transmissions from these to vertical-spindle stirrers through spur gears. The reaction of these stirrers alone is responsible for the rotation of the main arm. A 275-cu. ft. per min. Reavell air compressor with a 50-HP drive in a near-by pump house provides for the compressed air agitation of the slurry in the basin. With suitable couplings and glands the air pipe roughly follows the power-transmission lines up the centre along the main arm and down each stirrer.

The slurry from the mixer is delivered by either of two three-throw pumps with 10-HP drives to the inlet of the kiln where there is a scoop feeding wheel with a variable-speed driving motor, so that the quantity of slurry feed into the kiln can be varied. A rocker arm actuated by the slurry as it falls periodically from the scoop carries a mercury switch and this operates a light on the appropriate panel of the central control board.

The rotary kiln has a steel cylinder about 300 ft. long and 10 ft. in diameter set at a slight incline to the horizontal. It is driven by a 90-HP variable-speed AC commutator motor which also chain drives a small alternator supplying the motor driving the scoop wheel feeding the slurry into the kiln. The rate of feeding the slurry into the kiln is thus synchronised with the kiln rotation. The kiln-motor speed range is 760-190 RPM and the transmission is through a double-reduction box and spur wheels, giving the kiln a final speed of about 1 RPM. Air is blown by means of a fan driven by a 50-HP variable-speed motor through the clinker as it is conveyed over the grate by means of blades attached to the kiln shell. The clinker leaves the grate cooler at 220 deg. C. and is discharged direct into the clinker pit in the storage gantry. It is removed from this pit as required by the overhead grabbing crane and placed in the cement mill feeding hopper which is also in the storage gantry. An alternative method of taking the clinker from the grate cooler discharge chute is by means of a chain bucket elevator driven by a 10-HP squirrel-cage motor through reduction gear.



One end of sub-station showing 11-kV switchboard (left); transformer (right) and lighting board (front)



Other end of the sub-station showing 3.3-kV switchboard and 440-V board on right

The kiln is fired by pulverised coal. Rail-borne coal is delivered to the works siding on the old works site and discharged into a conveyor feeding an elevator which serves a small storage hopper from which are fed Diesel-hauled narrow-gauge trucks. The conveyor is driven by a 5-HP motor, and the elevator has a 7½-HP drive. The conveyor motor also drives a small DC generator which supplies a magnetic separator in the system for the removal of tramp iron. The locos transport the coal to the new works proper and deliver it to a hopper from which a belt conveyor driven by a 10-HP motor (970 RPM with worm reduction) transfers the fuel to the storage gantry. This coal-handling plant is also used for gypsum which, in turn, is placed in a separate bin in the storage gantry.

The store crane delivers the coal to hoppers feeding a coal mill. This has two chambers—one for drying and the other for reducing. Hot air from the kiln is used to dry the coal and is subsequently passed through the grinding chambers carrying away with it the finely ground fuel. The ground coal is separated in a cyclone and is passed on to a ground-coal storage hopper. The dust-free air is blown into the kiln, carrying with it measured amounts of powdered fuel required for burning the clinker. The various auxiliaries forming part of the kiln and coal mill departments are driven by motors mostly operated by means of automatic contactor panels all mounted together on a centralised kiln control board which is also fitted with various instruments for controlling the draught, temperature, &c., of the kiln exit gases, kiln outlet and coal mill hot air. All the kiln drives are by variable-speed slip-ring motors with resistance rotor regulation, except, of course, the main AC commutator motor already referred to. The control of the kiln-house auxiliaries is also effected on the central board, but for emergency use every motor is fitted for local push-button control.

Cement clinker and gypsum are fed to the cement grinding mill *via* the crane grab and hoppers which serve the feeder tables at the inlet of the mill. The mill is charged with about 50 tons of special steel grinding balls and is rotated at 20 RPM by a 785-HP synchronous induction motor. The mill is water-cooled and the grinding is the final operation in the actual production of cement.

Cement from the mill passes through an automatic weighing machine and is conveyed by means of an elevator to electro-pneumatic transporting plant which is served by an air compressor driven by a 150-HP, 735-RPM, 3.3-kV motor. Cement is blown by the compressed air (700 cu. ft. per min.) through a pipe line running from the cement mill department to the silo storage department and packing plant at the old works site. The line is 1,400 ft. long. There are two 1,600-ton and four 320-ton silos, and cement can also be stored in the old works silos.

Under the new silos there are pneumatic extractors which feed a long screw conveyor which, in turn, feeds a bucket elevator. From this the cement is discharged into three steel hoppers over the packing machine. This will fill 1,200 one-cwt. bags per hour. As the cement enters the machine a slight addition of air imparts a desirable "flow." One man only manipulates the machine which, after filling, discharges the bags into a conveyor feeding the shipping platforms. There are also in the packing plant about ten auxiliary machines driven by motors ranging in capacity from 0.5 HP to 10 HP.

The electrical scheme as well as the complete cement works was designed by the consulting engineers for the Rugby Portland Cement Co., Ltd., Parry & Elmquist, Ltd., who were also responsible for the electrical installation work which was carried out under the personal supervision of the consultants' chief electrical engineer, Mr. E. Scherman, A.M.I.E.E., who, in collaboration with Mr. Johnson, works manager, helped us to collect the above information. We are indebted to the Rugby Portland Cement Co., Ltd., for permission to visit the works and take photographs, and congratulate them on the plant which although the smallest is the latest of their four works and is certainly most up to date and efficient. Its product is claimed to be one of the best cements made in this country and fully upholds the 100 years' tradition which lies behind the manufacture of "Crown" cement.

Rationing Scheme Amended

AS we foreshadowed in our last two issues the Mines Department has decided to amend the scheme for rationing electricity and gas and the following statement was issued by the Secretary for Mines last Friday:—

> "After having examined the extent of the economy which has taken place in the use of gas and electricity as a result of the reduction of lighting due to the blackout, the Government has decided that it is possible to relax the rationing of these commodities.
>
> "The scheme now in force requires a limitation of the use of gas and electricity to 75 per cent. of last year's consumption, and a new Order will at once be made raising the rationing figure to 100 per cent., thus permitting users to consume, when necessary, the same amount as last year. It is necessary to keep the rationing machinery in operation to prevent excessive consumption and to enable a reduction of consumption to be secured by a revision of the rationing figure if, at a later stage, changed circumstances should necessitate it.
>
> "The Government has taken this decision in the light of the circumstances which have so far prevailed. It is, however, impossible to foresee what circumstances may arise in the future and the Government wish to urge upon the public the great national importance of saving fuel and earnestly appeal to them voluntarily to prevent any unnecessary or wasteful use of gas and electricity."

We comment on this matter in a leaderette.

Tramway Accident Reports

IN order to relieve tramway and trolley vehicle undertakings of the necessity of reporting minor accidents during the present emergency the Minister of Transport has modified the existing instructions on this subject.

It has been decided that all cases of cars running away shall be reported but only cases involving fatality or serious injury shall be reported where persons are knocked down or fall in front of cars or from car platforms. Only in cases involving fatality or serious injury or considerable damage to cars, other vehicles or property shall reports be made of collisions between two cars, collisions between cars and other vehicles, cars derailed and all other classes of accident including axles breaking.

Electrical accidents are only to be reported if they involve fatality or serious injury or if they have extensive results on the operation of the system or are of an unusual nature.

Serious personal injury is broadly defined as amputation of limbs, fractures or dislocations, internal injuries or severe electric shock or burns. Returns of accidents directly arising out of enemy action should be so marked. Accidents to employees calling for report under the Notice of Accidents Act, 1894, should continue to be reported.

A.S.E.E. Decisions

THE Association of Supervising Electrical Engineers is now operating from 36, Heddon Court Avenue, Cockfosters, Barnet, Herts (telephone: Barnet 5660), although the London office remains open.

At a meeting of the Executive Committee on September 25th the work of the Special Emergency Committee was approved. It was decided that the membership of members joining the forces should be suspended and that such suspension would apply to liability of the Association for all financial benefits. The suspension of membership would be terminated on their return to civil life provided their subscription accounts were clear on the date of their joining the forces and there would be a full resumption of financial benefits after a qualifying period of three months. Notwithstanding these decisions it is proposed to continue to send to members in the forces normal Association communications and the official journal. A decision on the continuation of the unemployment benefit scheme during the war was left to members of the scheme.

A number of cases relating to conditions of employment were received at the meeting, and it was hoped to resume these matters immediately conditions warranted it.

STREET LIGHTING PROBLEMS

The Efficacy of Central Control Systems

TWO well-known engineers who are authorities on public-lighting control recently expressed to us in the strongest of terms absolutely contrary views on the advisability of re-establishing a measure of public lighting in wartime. One said, in effect, that all sections of the public were suffering unnecessarily from the black-out and it was in the interests of all that a modified form of public lighting should be introduced at once. The other said that the "black-out" has driven people off the streets—a vitally essential thing from the viewpoint of public safety and one that should dominate all other issues. Both of these engineers are ready to prove, however, that public lighting can be controlled in any way likely to be called for in the event of such lighting being permitted.

With such a conflict of opinion on general policy from technical experts (and it is obvious that self-interest is far from their first consideration) we cannot take sides and we will not make any attempt to challenge Government policy in so vital a matter. Recent statements from official quarters, however, appear to have given rise to the impression, even within the electrical industry, that centralised control of public lighting cannot be established without interfering with other services. This raises an altogether different issue—can the electrical industry cater for such control if it is called for?

It is with the object of clearing the air on this point that we have invited some of the manufacturers responsible for self-contained centralised control systems and some of the supply engineers who have already installed or are considering establishing such systems to express their views.

No Pressure on Government

The Metropolitan-Vickers Electrical Co., Ltd., states that it cannot support any publicity campaign designed to bring pressure to bear on a Government Department with the object of effecting an alteration to an existing ruling, but it is of the opinion that a clear statement of facts concerning the advantages of centralised control is highly desirable at the present time. This attitude is entirely our own in putting forward the pros and cons as expressed by interested engineers on various aspects of the subject in the following notes.

The first thing to be considered is the desirability or otherwise of re-establishing public lighting in some form during the war, and on this point Mr. R. A. McCulloch (Salisbury undertaking) says that the dangers of completely blackened streets cannot be exaggerated, and suggests that if street lighting is allowed central control should be carefully considered because what would be in most cases a reasonable cost of an installation would be a low price for increased public safety.

Mr. W. F. Russell (Lichfield) thinks that with a modified form of street lighting accidents would be considerably reduced, night journeys would not be so depressing, and that the number of police reserves could probably be reduced. Mr. T. M. Climie (Falkirk) says that centralised control was installed in his town in the first instance, particularly for black-out purposes, and that it was expected to be absolutely necessary in wartime. On the other hand, Mr. S. R. Windle (Grimsby) says that while the use of street lighting in wartime would have advantages to the public and to industry, it is unwise to press unduly for it as the overriding considerations are those of public safety, public policy and geography.

Mr. E. E. Hoadley (Maidstone) thinks it is highly desirable that the present conditions should be eased if amelioration can be brought about without imperilling the safety of the people. Some modified form of street lighting might be permitted, he writes, in those places where it could be established that lighting could be extinguished between the time of sounding the air-raid siren and the time when raiding aircraft could arrive within, say, fifty miles from the lighting system.

The Automatic Telephone & Electric Co., Ltd., stresses the improvement in public morale that would result from public lighting, and says that assuming it is possible to devise street lamps which will give the required light and at the same time not cause a glare in the sky then street lighting is to be greatly desired if it can be centrally controlled.

Mr. P. J. Robinson (Liverpool) writes:—"That some measure of relaxation of the present street lighting restriction should be considered is apparent from the accident total of the first week of the war, when 3,400 people were killed or seriously injured on the roads. Further, the absence of street lighting has unquestionably encouraged forms of lawlessness which normally the authorities are at pains to suppress with a firm hand."

We have heard very little indeed as to the existence or otherwise of suitable equipment to meet wartime lighting requirements, but Mr. C. Orchard (Hornsey) says it would be a simple matter to fit pilot lamps in special shades to throw a strip of light down the lamp-post itself and thus remove the objection that enemy aircraft would be guided to towns by glow in the sky.

A representative of the General Electric Co., Ltd., feels that it may not be possible to work with any known form of public lighting equipment. He makes a rough and ready, but particularly useful, we think, classification of possible conceptions of wartime lighting—modified street lighting and "dark adaptation." The latter, he suggests, is the more likely thing to be permitted, and his idea in this respect is, say, 15-W lamps at normal heights and spacings with special shielding. The criterion is what can be seen from the air and judgment on the effects of one fitting could not possibly give a true picture.

A most important consideration bearing on the desirability of lighting, if a suitable system can be devised, has been raised in two quarters, namely, can the enemy spring a surprise on us? Mr. Windle says that it is sometimes overlooked that the proposal to use street lighting in war with instantaneous switching postulates that a warning will always be received some minutes before enemy aeroplanes arrive. While the defence services might possibly be able to guarantee this for towns in the west, it seems doubtful whether they could do so in respect of towns near the east coast. Mr. Hoadley says that the primary condition to be satisfied before any outdoor lighting could be allowed is whether it is established that enemy aircraft could not get through our defences and fly over our country without being detected, and the answer to this must come from the Royal Air Force and from none other. It is actual experience and not any amount of theorising that can supply the information.

Assuming that suitable public lighting can be established, the next question for consideration is if it can be suitably controlled. On this point Mr. E. C. Lennox (North Eastern Supply Co.) says that public lighting can be easily controlled from a central position for black-out purposes without in any way disturbing the other services provided from the electricity mains. There are two systems, one which relies upon interconnection of sub-stations by means of telephone lines, and one which relies upon impulses over power lines. The latter would be the more safe under conditions which might be expected. Several of the engineers who have contributed to this discussion have referred to the operation of the systems they have had installed without difficulties of any description.

Metropolitan-Vickers summarise the advantages of centralised control as follows: Small cost of installation, instantaneous operation, immediate switching on after the "all clear" to enable A.R.P. work to proceed efficiently, and easy conversion for peace-time use.

Effect on the Public

Would the operation of centralised control under emergency conditions unduly alarm the public? The Grimsby engineer suggests that extinguishing the lights before sounding the sirens would be taken as an air-raid warning, and that even if it were made clear that switching off the lights was only a preliminary precaution nervous people would be alarmed and at once seek shelter. The Automatic Electric Co. stresses that it could easily be arranged for the lights to be extinguished in two movements, half going out at once and the other half when people had had an opportunity of leaving the streets. It is thought that the idea that the lights should be extinguished on the occasion of every preliminary warning implies a complete lack of understanding of the speed and certainty of operation by modern centralised control. Mr. H. R. Harral (Blackburn) would say that it is possible to control street lighting without unduly alarming the public, and he thinks that a rough and ready scheme which he has in mind, involving the use of half a dozen relays and various street lighting units connected to several disused DC feeders radiating from the distributing station, would make it possible to give some indication to the public by switching the lights off and on two or three times before finally extinguishing them in response to emergency messages.

Mr. Climie says it could be quite easily arranged to meet the black-out conditions by first switching off main lighting, to be followed a few seconds later by switching off emergency lighting. While the Lichfield engineer thinks that two-step switching could easily be arranged, he feels that too much

stress is being placed on this point because if raids should occur the public would get accustomed to shocks.

The General Electric Company's representative thinks that any form of "modified street lighting," if it were permissible, would have to be switched off on the "yellow" signal, with often unnecessary alarm as the probable result, but with "dark adaptation," it might be possible to delay switching off until the "red" signal. Mr. Robinson holds with the view that sudden plunging of the streets into total darkness would lead to confusion and possible panic, but he asks if it is necessary to secure the black-out instantaneously. He also suggests two switchings, the smaller group of lights being the second one.

What of the reliability of centralised control equipment once it is installed? During two years of peace-time operation at Maidstone there was no failure of any kind. Mr. Orchard considers that the system is excellent and it has given practically no trouble: in fact, less trouble than the old-time clock system. Measurement, Ltd., hold the view that a central control installation implies that all the eggs are in one basket and the failures which have in the past occurred on ill-conceived central control projects, both in this country and abroad, have been due to a lack of realisation that a single failure of such a system can be more than an inconvenience—it might be in wartime a source of major disaster. In consequence, the designer of a system should approach the problem with the same caution that the designer of a vital item such as a circuit-breaker would exercise.

Mr. Windle visualises the possibility that the whole system might fail to function immediately or that individual relays might not extinguish the lamps when required, a risk which varies according to the system in use, and although he says that in all well-tried systems this chance is small in wartime, the effects of one such failure might be so dire that serious consideration must be given to it. Measurement, Ltd., raise what appears to be a vitally important point regarding the possibility of interference with other control systems. At the present time, they write, it is recognised that some ripple control systems have the weakness that they may interfere with the operation of similar equipments in adjacent networks. This is obviously a most serious defect for which, if it arises, there is no cure, since no form of effective interference suppressor has been or, in their view, can be devised if a ripple control system is so designed as to be fundamentally prone to interfere with others.

Peacetime Uses

A good deal of attention has been given to the value of centralised control for wartime uses other than public lighting. The Salisbury engineer reminds us that a remote control system is capable of extension to other important services such as signalling to firemen and air-raid wardens' call bells. The value of such an installation in wartime is difficult to overestimate. Mr. Russell points to the centralised control of sirens. In Lichfield there are six sirens, each placed in such a position that whichever way the wind blows the city is covered and they are naturally synchronised by the control system. These two-note sirens are operated by compressed air. In certain positions it has been possible to obtain the use of works compressed-air plants and in other places small compressors which store sufficient air for two or three signals have been installed, and these automatically commence charging should the pressure fall and cut out automatically when full. The advantages are that since all the high notes and the low notes are tuned and synchronised respectively, the criticisms with regard to confusion resulting from faulty synchronisation are met.

A statement from Falkirk with regard to the application of centralised control to supply emergency staff draws attention to a particularly interesting and important aspect. The engineer says that to carry an emergency staff for twenty-four hours a day, consisting of first-aid and decontamination squads as well as emergency repair units, is well nigh impossible in a small undertaking. Further, the effect of having the men standing by night and day with more or less nothing to do than patiently wait for something to happen is not only unnerving but has a bad effect on efficiency. The present procedure is that the minute an impending air raid is notified a signal is sent out to all the men who may be required. This in itself has meant a substantial saving in men's time standing by for an emergency.

Most engineers have stressed the peace-time value of centralised control, particularly for off-peak working, and agreed that expenditure on such a system now should not be regarded as expenditure on a purely wartime measure.

We hope that the foregoing expressions of opinion may help our readers at least to obtain a better appreciation of the position as it is to-day, and perhaps to make up their minds whether or not it is right to establish lighting of any sort in wartime. One thing is certain—there are available self-contained systems of centralised control capable of dealing with wartime lighting should it be introduced. The following brief descriptions outline some of the systems.

G.E.C. System

In the system of the General Electric Co., Ltd., alternating currents of musical frequencies, *i.e.*, between 200 and 800 cycles per second, are injected into the supply mains to operate receiving relays at the points to be controlled. A receiving relay has two reeds, tuned so that one responds to a particular frequency and the other to a different frequency. It can, therefore, perform two operations, such as switching a street light "on" and "off." The total number of different operations that can be controlled on a power network depends only upon the number of different frequencies provided.

False operation is prevented by the design of the relay, which has a magnetic circuit with an extremely sharp frequency response, and the operating signal is of such a character as to make the reproduction of it by an unauthorised person extremely difficult. It is also immune from operation by impulses of current due to switching surges, disturbances and faults. An operating condition of the relay is that the signal current has to be sustained for several seconds before the switch is operated. Furthermore, the mechanism of the relay is so designed that, in general, switching surges produce no net movement of the mechanism.

The super-imposed currents may be injected into either the high- or low-voltage side of the network, the method employed and the manner of control depending upon the lay-out of the network and the controls required. Dependent on circumstances, the super-imposed currents may be produced either by motor alternators or by thermionic valve generators. The system has been so designed that further signals (frequencies) can be added at any time without any alterations or additions to the receiving relays already installed, and it is an important feature of the multi-frequency system that it uses only one kind of signal and requires only one type of receiving relay.

The character of the injection equipment varies considerably according to whether the injection is performed on the low-voltage or high-voltage network. On systems where the distribution is carried out at a very high potential from the generating station to a small number of primary sub-stations where transformation is effected down to, say, 6.6 kV for transmission to a large number of low-voltage sub-stations, it may be more economical to inject at these primary sub-stations on the 6.6-kV side of the transformers (either series or parallel method) rather than to inject into the e.h.v. system, where the cost of e.h.v. injection transformers might be excessive.

S.T.C. Multi-Service System

The system of Standard Telephones and Cables, Ltd., known as the "Multi-Service System," provides facilities for the control of thirteen different services by means of direct current impulses superimposed on the low-voltage network. Application of the DC impulses, which are obtained from a 6-V large capacity storage battery, to the network is made at the sub-station between the star point of the transformers and the neutral of the system, by means of a simple and robust contactor panel calling for no more maintenance than is normally given to such type of equipment. Facilities are provided in the contactor panel which positively prevent any open circuit of the neutral under all conditions of operation, whilst the simplicity of the scheme enables it to be easily and readily installed by the supply authorities' own staff.

Two broad types of receiving equipment are employed; the first is a simple polarised relay which responds to either positive or negative impulses of short or long duration, whilst the second type comprises a synchronous selective mechanism relying for its selection upon the time interval between two successive impulses. These time intervals in the second type are multiples of five seconds within a period of one minute, thus giving eleven possible selections. Here again the timing device is the small synchronous motor used in electric clocks which has already proved its reliability. Obviously, the facilities available can be used for any of the services, and it is usual to find the simpler relay receiving units used for those services which require the greatest number of receiving units in this respect. The present use for this type of relay in Great Britain has been almost wholly for street lighting, but in the case of many equipments which have been exported the simple relay has been used for domestic off-peak load control where this facility has been considerably developed by the particular undertaking.

Although the system can be operated from each sub-station individually, equipments can also be supplied enabling the sub-stations to be controlled from a central point, either by means of impulses transmitted over telephone pilot wires, where these exist, or alternatively by DC bias impulses transmitted over the high-voltage inter-connectors between the

supply point and the sub-stations. In either case all the benefits of centralised control are easily applicable with the minimum of equipment at the central point, whilst at the same time many users are finding local control from the sub-station of considerable use under emergency or fault conditions.

"Rythmatic" Centralised Control

"Rythmatic" control (Automatic Telephone & Electric Co., Ltd.) is a fully centralised system which enables any one of 24 different switching operations to be performed by the depression of a push button located at a central point. The system is applied over existing high-voltage power supply networks, and the need for pilot wires—frequently a weak and expensive link in the signal chain—is eliminated. There is no interference, either with the normal functions for which the power supply is used or between the individual switching operations effected by "Rythmatic" control itself.

The system utilises four separate values of audio-frequency current of the order of 500 to 3,000 cycles for injection on the network conductors. Each frequency used is interrupted in six sets of timed impulses to give the total of 24 separate signals. Differentiation between individual switching facilities is therefore effected by dual selection, being dependent on both rhythmic interruption and frequency, and thus affords complete immunity from parasitic and surge potentials. Injection of the signal energy is effected on the low-voltage bus bars at one central point, after which the signal energy penetrates *via* the main transformers and high-voltage lines to the low-voltage bus bars at all sub-stations.

The transmitted signals are picked up by the control switches or relays which effect the desired selection. These are extremely sensitive, and operate from very little power, and the injection equipment is kept correspondingly small. It is this low injection power which makes "Rythmatic" control economically applicable to both AC and DC networks.

The "Rythmatic" relay consists essentially of (1) a tuned circuit which responds to one only of the four frequencies used, and (2) two swinging armatures with natural periodicities corresponding respectively to two of the several impulse timings, which can only be fully deflected by repeated impulses at the correct periodicity. The armatures are fitted with metal contacts which close momentarily when the amplitude of oscillation reaches a predetermined extent.

The low power required enables injection to be made normally on the parallel method on existing transformers and avoids the much higher costs of series injection with the consequent necessity for injection transformers capable of carrying the full load current and able to withstand the high rupturing capacity of the h.v. bus-bars. Facilities are provided for the remote control of the injection equipment by pilot wires to initiate any particular service or signal if required. For example, control of the signal to sound the air raid sirens can be effected from an A.R.P. headquarters.

Actadis Method

The principle of the "Actadis" system (Measurement, Ltd.) is to inject a voice frequency current into the high-voltage feeders, which current is transformed by the sub-stations on to the low-voltage networks by exactly the same process as the load itself, and which operates tuned relays for the control of the various services enumerated. To obtain the discrimination between the various controls, ripple signals of different frequencies are used, the frequencies employed being from 300 to 850 cycles.

The transmitter comprises the following elements:—Variable-speed motor-generator set, generally driven by a DC motor, which generates the ripple signal; and condenser equipment which corrects the power factor of the ripple output, and prevents the impression of a 50-cycle voltage on the terminals of the alternator; contactor gear which selects the correct circuit arrangements associated with the different frequencies, which starts and stops the motor generator and provides automatic regulation of the frequency and voltage of the ripple. The ripple is injected on to the network by means of transformers, generally, but not invariably, placed in series with the outgoing feeders. These transformers have to be of extremely robust construction, as they continually carry the feeder load.

The whole equipment is controlled from a main control panel comprising various push-buttons, pilot lights, relays and the like. This control panel is generally provided with all its essential apparatus in full duplicate. Thus to switch street lights on, it is only necessary to turn a key corresponding to the correct signal frequency and then press a button, whereupon the generator starts up, the circuits are correctly tuned, and the output of the generator is delivered to the network through the transformers mentioned above. The transmission apparatus is separately designed for each system, to suit not only the characteristics of the system as they exist, but, what is more important, the characteristics of the system as they may be in the course of years of future load development.

The reception relays comprise the following elements. A tuned circuit which provides a coarse selection by separating the ripple frequency from the load frequency. The ripple frequency is then impressed on an electromagnet, the armatures of which take the form of tuned reeds, one reed being tuned to the frequency corresponding to "ON" and the other reed to "OFF." The vibrating motion of the reeds is converted to rotation by a pawl and ratchet device which drives a heavy mercury contact through a reduction gearing. A special mechanism is interposed to prevent the relay being inched by mechanical shocks.

"Ripplay" System

The "Ripplay" system of the Metropolitan-Vickers Electrical Co., Ltd., superimposes on the 50 cycles per second of the normal power supply its own very small "ripples" of frequencies, ranging from 400 to 1,000 oscillations per second, without in any way affecting the normal power supply and, indeed, without these ripples being detectable except by the special little devices used for receiving the signal impulses. A large number of different frequencies can be used for different switching or signal purposes, each frequency affecting only the particular receiving device or devices which may be set to respond to it. By means of a dial on a control board at the central power station, or other desired point, the required ripple frequency may be selected and at the simple push of a button the impulse is transmitted throughout the distribution system, thus causing to operate only those particular receiving devices which are set to respond to it.

To effect any such control by ordinary methods would mean the special laying of multicore cables, the first cost and maintenance of which would prove prohibitive. The "Ripplay" control system impulses, on the other hand, are sent out on the existing high-voltage and low-voltage cables, and are available for the use of any consumer. It involves no change in the existing extra-high-voltage bus-bar equipment, or indeed to any of the main generation or distribution equipment. The system is applicable to any kind of network, even the most complicated, and it is extremely economical in use, the power consumption being so small as to be entirely negligible.

For load control, this system makes it possible to switch on or off, from the power station, any unit or group of units of lighting or other load on the network. For signal communication, the equipment turns the whole electricity distribution system, so to speak, into a broadcasting network on which at various points simple receiving devices may be connected to pick up and respond to appropriate signals.

Modified Street Lighting Schemes

IT is reported that a new system of lighting complying with the black-out regulations and also providing a safe guide to traffic has been devised by the Liverpool city electrical engineer (Mr. P. J. Robinson) and approved by the Electricity Committee. The system has been tried in Castle Street with successful results and the city electrical engineer has been instructed to extend it to the more important thoroughfares of the city. No direct light is emitted, only a diffused glow. Observers 80 ft. above ground level saw nothing of the light below and others driving motor cars found that there was sufficient light to guide them. It was claimed that a pedestrian could be seen crossing the road 20 yd. ahead. The new lamps, 200 of which are to be erected, will be placed at a height of 12 ft. from the ground. They consist of small electric bulbs which throw their light upwards on to white painted reflectors 20 in. in diameter.

At Johnstone (Renfrewshire) ultra-violet-ray lamps and fluorescent paint are being experimented with, and it is claimed that the method devised, while of immense value to pedestrians and drivers, gives illumination that is invisible at a reasonable height. The scheme has been prepared by Mr. J. Orr, consulting engineer, Glasgow, and has aroused a good deal of interest. A similar system is being tried out at Motherwell, where ultra-violet-ray lamps fitted to the ordinary standards are used in conjunction with fluorescent paint on the pavement to provide a guide for pedestrians and traffic.

A scheme prepared by the borough electrical engineer of Blackburn (Mr. R. H. Harral) provides for 300 low-power lamps spread over the principal traffic routes and junctions normally lighted by electricity, all capable of being extinguished immediately in an emergency by a central switch.

I.E.E. Students' Supper

THE first social event of the current session of the London Students' Section of the I.E.E. is an informal supper, to be held at "Ye Olde Cock Tavern," 22, Fleet Street, at 7 for 7.30 p.m., November 3rd. Admission is by ticket only, obtainable from the hon. secretary, Mr. G. King, 31, Kenninghall Road, Upper Edmonton, N.18.

ELECTRICITY SUPPLY IN WARTIME

Some Effects of Evacuation

THE decision of the Mines Department to increase the ration of electricity and gas allowed to domestic and small industrial consumers from 75 to 100 per cent. of last year's consumption will be received with a sigh of relief by all concerned, but, unless the announcement is a graceful way of intimating that rationing in so far as it affects domestic electricity and gas consumption has been abandoned, the promised new Fuel and Lighting Order will not relieve supply authorities of the enormous and now almost unnecessary duty of indicating to all their consumers what their rations are. Scared and made "economy conscious" by the publicity already given to the Order, there is little likelihood of consumers overstepping their allowance, especially with the need for revision of the family budget.

For this reason the introduction of rationing, even if dropped now, may be considered to have had the desired effect, though it is quite possible that an appeal to economise such as is now being made by the Mines Department would have achieved the same result without nearly the same anxiety, not to mention muddle. At all events with the concession now made there appears little to be gained by the continuation of the provisions of the Order whereby supply authorities are expected to notify all consumers of their rations. Most consumers know or can find out for themselves what their last year's consumption was without, in most cases, troubling the supply undertakings. In any case, the few who exceeded their allowance for the current quarter could be warned to mend their ways when the accounts were sent.

The Order was apparently framed under the fallacious impression that the majority of consumers waste electricity. Except, perhaps, in the almost negligible case of lighting as used by consumers on two-part tariffs, there is little justification for this attitude and the imposition (if this were practicable) of the restrictions in their original form would no doubt have resulted in untold hardship. However careful they might be, a very large number of consumers would have exceeded their ration. It would not have been practicable to cut them all off as it would have been impossible to deprive them of lighting, heating and cooking, especially during the winter, apart from the fact that this treatment or threat of it would prejudice the undertaking's interests and so affect the good will of the consumer.

In Reception Areas

Some interesting facts arise out of an investigation into how undertakings in reception areas are faring in the present conditions. By no means all of them, for instance, are benefiting by increased output, and a reduction of 20 per cent. or even more in sales is not uncommon in areas where the load is almost entirely domestic, Brighton and Eastbourne being cases in point.

Other undertakings are, of course, better situated. To take a typical example, Mr. F. Bent, borough electrical engineer and manager of Aylesbury, tells us that the increase in domestic demands due to increased population have more than compensated for the reduction due to rationing and the loss of street and shop-window lighting, both consumption during the first three weeks of October and also the maximum demand being 15 per cent. higher than in the same period last year. Allowing for a 5 per cent. increase in demand attributable to greater industrial requirements, the advance in maximum demand due to domestic consumption is about 10 per cent.

Sometimes, even when consumption is reduced, the maximum demand shows an advance as a result of increased cooking for "evacuees" and possibly an overlap of industrial load accelerated in daylight hours. At Bedford, where there are approximately 25,000 evacuees, Mr. P. G. Campling, the borough electrical engineer, informs us that since the outbreak of war the maximum demand has increased by 5,000 kW, in spite of the fact that sales have suffered a considerable reduction instead of the normal increase of 6 per cent. recorded up to September. On Sundays the midday peak has increased by 2,000 kW or 15 per cent., all of which is attributable to cooking. In many districts of the town electric canteens have been established, the Bedford Corn Exchange, for example, having been equipped to supply meals at cost price to all evacuees, including visiting parents and school children. It seems rather unfair that the undertaking should be penalised for providing these essential cooking services when its bill comes in from the Central Electricity Board. There is also no compensating revenue for the exceptional number of changes of tenancy which amount to about three times the normal.

In some cases various complications make it difficult to trace the actual effect of wartime conditions. At Reading, for example, it is not clear whether the 16 per cent. increase in electricity consumption is due mainly to the increase in population or to exceptional activity last year in developing the domestic load.

As in London, it is being generally found that the loss in shop-window lighting is being offset to some extent by an improvement of interior lighting. On the other hand, however, as a result of the black-out conditions and the earlier closing of shops, etc., many undertakings are faced with a substantial loss in revenue from business all-in tariffs based on installed lamp load. In cases where the supply is taken from the Central Electricity Board, reductions in street lighting and shop-window lighting will often be counterbalanced by a drop in the maximum demand, thus improving the load factor and lowering the average cost per kWh.

Certain undertakings are taking advantage of the restrictions upon domestic development to consolidate their present position and to give extra attention to consumers who already have apparatus installed. An excellent opportunity is afforded now to illustrate the effects of economy which may be achieved by eliminating waste and this will be of advantage in emphasising the superiority of electricity over other forms of domestic energy. In this connection the Aylesbury Electricity Department is publishing a series of instructive articles in the local Press, and demonstrations are being given weekly on the preparation of economical dishes which may be cooked by electricity at the minimum cost. Mr. Bent is of the opinion that normal development should not be unduly retarded owing to war conditions, but it should proceed on sound lines.

Frequency Changing

THE fundamental principles involved in the use of "Mutators," the practical development of which is said to have been due to the initiative of Dr. O. Löbl, for changing the frequency of AC from three-phase at 50 cycles to single-phase at 16⅔ cycles for railway traction are examined by Dr. Ing. R. Feinberg in a paper published, without being read at a meeting, in the *Journal* of the Institution of Electrical Engineers for October. Dr. Feinberg was formerly at the A.E.G. research laboratories in Berlin and is now at Manchester University.

The term "Mutator," appears to have been first introduced by the Brown Boveri concern about five years ago to denote a mercury arc convertor designed with the aid of grid control for purposes other than plain rectification of AC into DC.

The present author's object is to report upon frequency-changing by this means as developed on the Continent and introduced experimentally by the German State Railways on a practical scale. His paper contains brief details of the 3,600-kVA set (6,000 kVA for one minute) at Basle for the Wiese Valley railway, with comments on the means adopted to minimise harmonic interference with telephone and radio communication. A 1,000-kVA set has been in operation at the Saalach power station both alone and in parallel with single-phase generators. A 3,750 kW set has been ordered for coupling a three-phase to a single-phase system, and a 3,150-kW set with an intermediate DC circuit has been installed at Pforzheim for coupling a 100-kV, 16⅔-cycle, single-phase network with a 220-kV, 50-cycle, three-phase grid system.

Frequency changing can be done in two ways (*a*) by direct conversion of the voltage with direct coupling of the primary and secondary networks, the single-phase voltage being built up from sections of the individual three-phase voltages; or (*b*) by employing a rectifier and an invertor having a DC circuit as an intermediate element between the input and output AC networks.

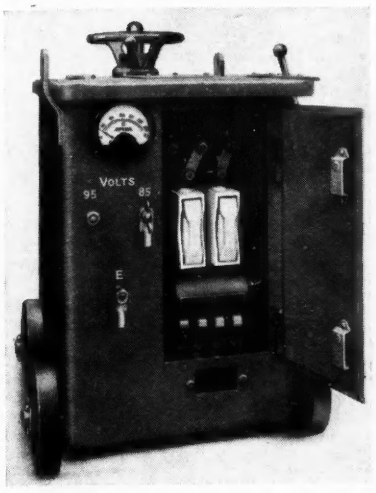
The author's conclusions are that each type has its advantages, but neither is perfect. The direct type is self-contained and can furnish secondary reactive VA, but the intermediate type cannot operate without an EMF and without an energy reservoir on the single-phase side; a no-load generator and/or sufficient capacitance must therefore be provided on the secondary side if the "Mutator" is not working in parallel with single-phase generators. Their efficiencies are about the same; the intermediate type may cost more, but its grid control equipment and maintenance may be less expensive.

In comparison with a rotary convertor the "Mutator" is claimed to have a higher efficiency, to be silent and easy to operate with the aid of grid control, of smaller weight and to need less costly housing and foundations.

ARC WELDING

Metrovick "Thermac" Range of Equipment

WHILE for certain classes of arc welding DC has been preferred, there is a wide and increasing field for which AC is entirely suitable when treated electrodes are used. The Metropolitan-Vickers Electrical Co., Ltd., has been manufacturing AC apparatus for several years, and has recently developed a complete range of a new design, named "Thermac," which provides a smooth variation of welding current over a wide range without the use of any tappings, while the separate reactor has been eliminated from the single-operator sets.



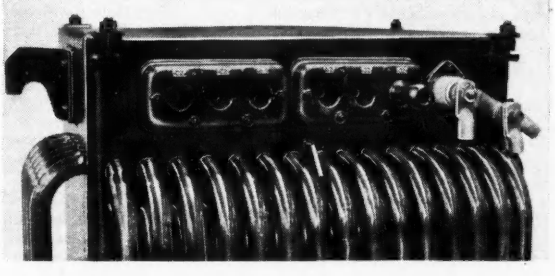
Single-operator set showing compartment housing the primary switch and fuses

The absence of tapping switches and terminals or plug boards, which the operator would have to change during the course of his duties in various classes of welding work, is a marked advance and is clearly an advantage to the user, bearing in mind the conditions under which arc welding equipments frequently have to be employed. The "Thermac" range of equipment includes single-phase sets for single operators, three-phase/two-phase sets for two operators only, and three-phase/three phase sets for three or more operators. Single-phase sets can be made to supply more than one operator, but usually a three-phase set is to be preferred.

All types are designed to give their full output at 85 V at the transformer terminals on open circuit, but the single-operator sets are also provided with a 95-V tapping for use on light current work where the higher voltage is an advantage.

In the single-operator sets the transformer is housed in a casing in which are also mounted a primary switch and fuse to form a self-contained, portable welding equipment of pleasing outline, with few projecting parts. The multi-operator sets have a stationary transformer (usually of the naturally cooled oil-immersed type) which may be situated in any convenient place, and a portable reactor is supplied for each operator to give independent adjustment of welding current. The standard single-operator sets and reactors for multi-operator sets are of the dry type, but oil-immersed apparatus is also manufactured when specified by a customer.

All equipments comply with B.S.S. 638-1935 at the nominal rating, but owing to the special insulation (B.S.S. class B) used in the construction of the dry type they can be safely used under continuous normal welding conditions at ratings

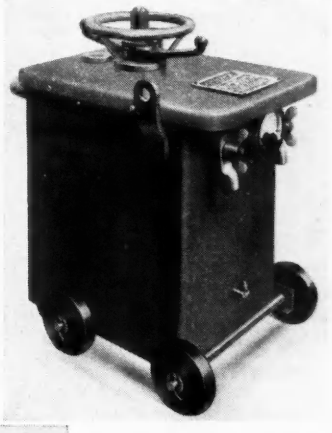


Plugs and sockets for single operators on secondary side of three-phase transformer

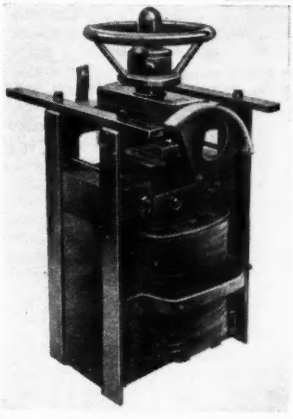
50 per cent. in excess of the nominal rating. The temperature limits permissible for oil-cooled apparatus, which of necessity has Class A insulation, limit the overload capacity to a smaller amount than for the dry type.

The single-operator set is convenient and reliable for up to approximately 450 A, with the current variation under the control of the internal reactance of the transformer. It is at present manufactured in the following sizes: (*a*) dry type: 200/300 and 300/450 A; (*b*) oil-immersed type: 200/300 and 300/350 and 400/450 A. The first figure is the nominal rating, to comply with the requirements of B.S.S. 638-1935. As stated above, the dry type can be safely operated in excess of this rating without injurious heating. The oil-cooled equipments can be operated for one hour at the higher ratings represented by the second figures.

Current regulation is achieved by movement of the handwheel at the top, which results in variation of the effective reactance between the primary and secondary windings of the transformer. Smooth variation is provided from approximately 30 to 300 A in the smaller sets, and from 50 to 450 A in the larger ones.



The input terminals are below the compartment which houses the primary switch and fuses, and standard equipments can be operated at 440, 400 or 220 V by selection of bolted links mounted above the fuses. Equipments for other input voltages can be supplied to order. The complete equipment is mounted on wheels, and hand rails are provided to assist movement. A mechanical indicator is calibrated in approximate current values, but an ammeter is also provided, as the value of the current depends to a certain extent on the length of cable in use. A locking lever secures the adjustment in any selected position. A diagram of connections is reproduced on the rating and instruction plate, made of "Traffolyte," which is mounted on top of the casing.



Reactor for independent control with illustration showing general construction

The transformers for multi-operator sets are usually the normal type of power transformer, oil-cooled. It is customary to include a primary switch and fuses, which are mounted on the transformer, and plugs and sockets (up to 300 A maximum) are provided on the secondary side so that the circuit of each operator can be disconnected without affecting those of the other operators. The plug is of the bayonet type, and has to be turned to release it from its socket.

Each operator is provided with a separate "Thermac" reactor for independent control of his welding current. The reactor is connected between the secondary terminal of the transformer and the electrode holder. It is housed in a similar manner to the transformer of the single-operator sets, and variation of welding current is similarly achieved by movement of the handwheel at the top. The reactor is at present made in five sizes (for dry and oil-immersed types) for the same current ranges and maximum values, as listed above, for the single-operator sets. A mechanical indicator is calibrated in approximate welding current values, and an ammeter is also provided. Movement of the handwheel varies the effective inductance of the reactor by vertical movement of part of the magnetic circuit. A single helical coil is enclosed by a laminated magnetic circuit.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

INCLUDED in the list of the more important recent appointments to the Ministry of Supply from outside the Government service are the following:—Sir Frank Smith, K.C.B., C.B.E., D.Sc., LL.D., F.R.S. (Director of Instrument Production), Mr. R. S. Whipple, M.I.E.E. (Assistant Director of Instrument Production), Mr. A. A. Rowse, M.B.E., M.I.E.E., M.Inst.C.E., (Director of Machine Tools), and Mr. J. Douglas, A.M.Inst.C.E., A.M.I.E.E. (Assistant Director Transportation Equipment), who is placed in charge of docks and out-door machinery.

Mr. H. Broughton, whose appointment as general manager of the Burnley, Nelson and Colne Joint Transport Board was reported in our last week's issue, has had a wide experience in passenger transport. He joined the staff of the Burnley tramways thirty-five years ago, and became chief administrative clerk. When the Department was merged into the joint transport board he retained his position. He has assisted with the change-over to buses, and has undertaken important duties in connection with the merger.

Mr. H. Broughton

Mr. G. Hardman, who is joining the Bombay office of the English Electric Co., Ltd. shortly, was married recently to Miss Nelsie Mary Graham.

Bradford Corporation Transport Committee has appointed **Mr. R. E. Cox,** of the London Passenger Transport Board, as technical assistant.

Mr. H. G. A. Stedman, chairman of the North-Eastern Centre, whose address to the Centre is abstracted in this issue, was born in London and received his early education at Burgess Hill and Biarritz (France). He gained his technical education in the City & Guilds science and art department and his mechanical experience at Southampton. He joined the British Westinghouse Co. as erection and testing engineer, and was responsible for many important contracts. Subsequently he was appointed assistant construction engineer with the Cleveland & Durham Power Co., and later became operation engineer. When this company was merged with the Newcastle group of power companies Mr. Stedman became electrical superintendent of the southern area, and three years ago was promoted to headquarters as chief of the transmission and distribution department. He has been twice chairman of the Tees-side Sub-Centre of the I.E.E.

The board of Crompton Parkinson, Ltd., has decided to change the directorial and managerial structure of the company in a manner that, in the opinion of the directors, will be of valuable assistance to the future management of the company. The articles of association have been altered to permit of the appointment by the board of a number of officials as executive directors and four such appointments have been made as follows: **Mr. C. F. Dickson,** who recently relinquished his position as managing director of Frigidaire, Ltd., to join the company. He is now sales manager responsible for the sales of the company's productions of electric lamps, lighting units and rubber cables. **Mr. J. Harwood Fryer,** A.C.A., who has been associated with the company and its subsidiaries for over thirteen years. He is secretary of the company, a position he took over shortly after the amalgamation with F. & A. Parkinson, Ltd., in 1927. **Colonel C. Hardie,** D.S.O., who is general manager of the Chelmsford works of the company. He joined the company in April, 1928, having previously been for many years assistant general manager with the English Electric Co., Ltd. **Mr. T. H. Windibank,** A.M.I.E.E., whose association with the company started in 1927, although for several years before that date he was closely connected with Mr. F. Parkinson in his electrical manufacturing activities. Mr. Windibank is now a sales manager and is responsible for directing the sales of the company's engineering products.

The associate company, the British Electric Transformer Co., Ltd., announces the appointment of **Mr. R. Weaving,** M.I.E.E., to be a director and the general manager. Mr. Weaving, who was previously with Ferranti, Ltd., and the English Electric Co., first became associated with Crompton Parkinson, Ltd., as manager of the transformer department at the Chelmsford works. In 1933, when the department was incorporated in the British Electric Transformer Co.'s works at Hayes, Middlesex, he became chief engineer and manager of those works. Col. Hardie has relinquished his appointment on the board on his election as an executive director of the parent company.

Derby Cables, Ltd., announces the appointment to its board of directors of **Mr. B. Hallows Barside,** who has been connected with Crompton Parkinson, Ltd., and its associated companies since 1927. In recent years he has been general manager of Derby Cables, Ltd., and he will continue to hold this appointment.

Atlas Sprinklers, Ltd., another associate company of Crompton Parkinson, Ltd., announces the appointment of **Mr. D. H. Chisholm** as a director of the company. He will remain in his present position of manager of the company's works, at Hayes, Middlesex.

At a meeting of the Council of the British Engineers' Association, held on October 19th, **Mr. J. J. Carter,** managing director of Crossley Bros., Ltd., and chairman of Crossley-Premier Engines, Ltd., was elected president of the Association for the ensuing year. The following new members have been elected to serve on the Council of the Association: **Major C. Pratt,** M.C., director, Blackstone & Co., Ltd.; **Mr. F. Wakeham,** (joint managing director, Cambridge Instrument Co., Ltd.); **Mr. D. Walker,** B.A., (director, Evershed & Vignoles, Ltd.).

A recommendation by the Electricity Supply Committee that an honorarium of 100 guineas should be paid to **Mr. G. Sommerville,** the electrical engineer, for services in connection with the sub-station extension scheme has been adopted by the Faversham Town Council.

Mr. R. Blackmore, M.I.E.E., who has been the Central Electricity Board's district manager for North-West England and North Wales since the adoption of the scheme for the Area in 1928, has tendered his resignation owing to ill-health. For the same reason **Mr. S. E. Fedden,** M.Inst.C.E., M.I.E.E., has found it necessary to relinquish his position as the Board's district manager for Mid-East England which he has held since the inception of the scheme early in 1929. These resignations will take effect on December 31st next, and the Board has appointed **Mr. C. T. S. Arnett,** M.I.E.E., to succeed Mr. Blackmore and **Mr. V. A. Pask,** M.I.E.E., city electrical engineer, Norwich, to succeed Mr. Fedden.

Mr. Arnett, who has been the Board's operation engineer for North-West England and North Wales since early in 1931, served his apprenticeship at the Heaton Works of C. A. Parsons, and underwent his technical training at Armstrong College, Newcastle-on-Tyne, under Dr. Thornton and Professor

Elliott & Fry

Mr. C. T. S. Arnett **Mr. V. A. Pask**

Weighton. He afterwards joined the Cleveland and Durham Power Co. (now the N.E.S. Co.) where he held various appointments on the operating staff. Subsequently he became chief assistant electrical engineer on the staff of Bolckow Vaughan & Co. and was later chief electrical engineer of the company's mines and iron and steel works. Prior to his appointment with the Central Board he was chief engineer to Pease & Partners, Ltd., Darlington.

Mr. Pask was educated at Preston and received his engineering training at the Preston technical schools and in the tramway department of the Preston Corporation. He subsequently served on the staffs of the Paisley, Hull and Bootle electricity undertakings and in 1920 was appointed deputy general manager and engineer of the Newcastle & District Electric Lighting Co., Ltd., a position which he held for twelve years. In July, 1932, he succeeded the late Mr. F. M. Long as city electrical engineer of Norwich. Mr. Pask has served on the Central Board's Consultative committee for the South-East England Area and has also been chairman of the Generation Committee of the I.M.E.A. for the same area. He is a municipal member of the National Joint Board and the National Joint Industrial Council for the Electricity Supply Industry and serves on the employers' side of the Council's Negotiating Committee, being also a municipal member of the District Board and District Council for the No. 8 (East Coast) Area. He is also a member of various committees of E.R.A. and E.D.A.

Mr. S. W. Fuller is the sales manager for "Ekco" lamps for E. K. Cole, Ltd. Before joining that company he was with Ensign Lamps, Ltd., with whom he was northern sales manager, and he was previously with Crompton Parkinson, Ltd. He has had ten years' experience in the lamp industry.

Mr. S. W. Fuller

Mr. A. Walmsley, a member of the staff of the Bedford Corporation Electricity Department, was married on October 7th to Miss Gwendoline May Dennis.

Mr. G. Moore, electrical engineer to the Kirkcaldy Corporation, has received an increase in salary of £215 following the Corporation's adoption of the I. M. E. A. scale of salaries.

Mr. R. H. Upton, of Ealing, has been appointed mains superintendent to Birkenhead Corporation Electricity Department at a salary of £506 per annum.

Mr. W. Holttum, whose address as chairman of the Mersey & North Wales (Liverpool) Centre of the I.E.E. is summarised in this issue, was educated at Birkenhead Institute and Liverpool University where he obtained the degree of B.Eng. with first-class honours and has subsequently received the M.Eng., degree. After workshop experience with Dick, Kerr & Co., Preston, he joined British Insulated & Helsby Cables, Ltd. (now British Insulated Cables, Ltd.) in 1914 as a contract department engineer, later becoming technical assistant on the head office contract department staff, and since July, 1937, has been chief assistant to the chief engineer. In December, 1937, he read a paper before the Transmission Section of the I.E.E. on "The Jointing and Terminating of High Voltage Cables."

OBITUARY

Mr. W. B. Guthrie.—His many friends all over the country will learn with deep regret of the death on October 22nd of Mr. W. B. Guthrie, who was well known as chief buyer for Bruce Peebles & Co., Ltd., Edinburgh. Mr. Guthrie's connection with the company extended for over thirty-eight years, he having spent the whole of his business career with them.

Mr. C. H. Hammett.—The death has occurred at the age of eighty-eight of Mr. Charles Herbert Hammett, of Pontypool. Mr. Hammett had had electrical engineering service with firms all over the country, and also in collieries. He was mainly responsible for introducing the electric coal-cutter at the Vipond Colliery, Varteg. At one time he was manager of the Corlett Electrical Engineering Co., Ltd., and then went to Pontypool, where for the last thirty-three years he was chief electrical engineer of the Pontnewynydd Sheet and Galvanising Works.

Wills.—Mr. Raymond Arthur Harrison-Watson, electrical engineer of Birkenhead, left £21,567 with net personalty £21,179.

Mr. L. A. G. Le Personne, chairman of the Power Plant Co., left estate of the gross value of £194,430, with net personalty £176,380.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Accident Prevention

UNDER this title you give in your last issue some extracts from Mr. H. W. Swann's Report, and I have studied the diagram of a suggested method of protecting a group of portable tools with interest, but so far without comprehension. Might I ask for further information, especially concerning any increase in efficiency of protection by means of this complicated arrangement over the more orthodox method.

Everything would appear to turn upon the nature of the earth connection shown in the diagram. If this be made to the conduits of the main supply to the transformer—the normal factory arrangement—then the earth tubes of the three-pin sockets are merely directly earthed and the leakage trip is superfluous. If the earth be made to a separate driven electrode —which, as has been argued elsewhere, is essential for the true voltage operation of the leakage trip—then it must possess some resistance, and the earth connections from the tool casings are ineffective.

The interposition of a transformer between the mains supply and the tools would appear to be in itself a safety measure, and the point at once arises whether the secondary circuit requires leakage protection at all. Protection is certainly necessary against leakage from the mains into the transformer secondary, but this is not effectively achieved by the method shown.

What is wrong with the orthodox method of connection, which would be the connection of the transformer core and casing, and the socket earth-tubes, with possibly one side of the secondary, if it be considered necessary for safety, to the end of the trip coil remote from the earth electrode when all possible forms of leakage are guarded against? The practice of connecting earth circuits to the electrode side of the trip coil cannot, in my view, be too strongly condemned, and I shall look forward to any explanation of its utility in the case put forward. In any case, I consider that the leakage trip should isolate the mains supply to the transformer, and not the comparatively innocuous secondary circuit alone.

Folkestone, *October 21st.* T. C. GILBERT, A.M.I.E.E.

Price Advances

Your correspondent, "In Esse" (why "In Esse" and not "In Posse"?), in your current issue makes the following statement in discussing the above subject:—

> "Certain firms in an Association have advanced prices by 7½ per cent., yet as the list prices are about 30 per cent. higher than those of their competitors outside the combine, a 15 per cent. advance by the latter may be readily justified."

It is quite true that members of a certain Association have advanced their prices by 7½ per cent., but even if there is any truth in the statement that their list prices are about 30 per cent. higher than those outside, why should that justify the firms outside it increasing their prices by 15 per cent.? If such an advance of 15 per cent. is justified, does it not show that the firms outside the combine have been quoting prices which were not sufficiently remunerative?

The firm of which I am a member has increased its prices by 7½ per cent., but, in point of fact, an advance of 5 per cent. was justified, and decided upon before the outbreak of hostilities, and was to come into force on October 1st. This increase of 5 per cent. was to cover increased costs of production, due to higher wages.

Any person engaged in the electrical trade, and in buying, will readily admit that the additional 2½ per cent. in no way compensates for the increases which have taken place in the individual prices of outside materials. In short, switchgear manufacturers far from indulging in profiteering, are selling their products on a relatively lower price basis than that which existed before the outbreak of war, but, up to the present, they have not taken any opportunity to tell the world.

Manchester, *October 20th.* W. BRIGGS.

I.M.E.A. Matters

AS we have already reported, the Incorporated Municipal Electrical Association now has temporary headquarters at the Leicester Electricity Department.

It is announced that owing to the present situation it has been necessary to cancel next year's Convention, but the annual general meeting will be held. An emergency committee, meeting once a month, has been appointed to deal with any matters which may arise and the Council is to meet quarterly.

To meet the problems arising out of the war it is thought desirable to attempt some form of co-ordination between associations representing supply undertakings and a conference of these associations is being convened to discuss the matter. It is proposed to hold monthly meetings and members are asked to forward as early as possible any matters which they desire to be discussed.

Representations are to be made to the Electricity Commissioners with a view to securing some modification of the present street lighting restrictions.

It is maintained that existing coal contracts should be fulfilled by suppliers at the agreed prices, unless those contracts contained a "war" clause. Coalowners are not entitled to demand any alterations in the terms whether by way of endorsement or otherwise.

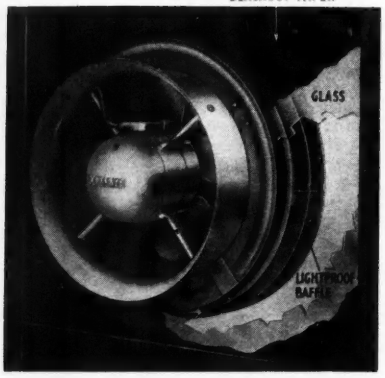
Undertakings which experience any delay in the execution of necessary work should get into touch with the contractors. If the latter are unable to prevent the delay the Electricity Commissioners should be approached, full particulars of the order being given. In the case of orders placed under the directions of the Central Electricity Board, the undertaking should first communicate direct with the Board which is in touch with the Commissioners in this matter.

A.R.P. EQUIPMENT

Special Apparatus Designed to Meet Present Needs

Equipment for A.R.P. Services

AN illustrated leaflet containing only eight pages but covering briefly all its equipment likely to be of assistance to A.R.P. officers has been published by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. It is divided into sections dealing with lighting; torches, batteries and bulbs; space heating; cooking equipment; water heating; refrigerators; ventilation; communication; radio; laundry, cleansing and sterilising equipment; public shelters; medical equipment; and sundries. Illustrations depict typical apparatus and the particulars which are given include dimensions, finish and, where possible, price.



How the G.E.C. "Xpelair" fan is mounted in a blacked-out window

Various suggestions as to equipment suitable for the different services are given by means of an index drawing attention to the appropriate sections.

The same company also indicates the adaptability of its "Xpelair" exhaust fans to obviate the bad ventilation that normally results from black-out conditions when all windows are screened or sealed. This type of fan owes its feature of being completely lightproof to the external baffles with which it is fitted. It can be mounted either in a circular hole in the window pane, the surrounding glass being covered with black paper or paint, or in a sheet of plywood substituted for the pane. In this way it is possible to comply with black-out requirements and at the same time retain the full guaranteed ventilating capacity of the fan, viz., 14,000 cu. ft. per hour. The power consumption is only 25 W.

A.R.P. Shades

There is no need for A.R.P. shades used for domestic purposes to be unattractive. ELECTRIC ART SHADES (1928), LTD., Feering Factory, Kelvedon, Essex, successfully demonstrate this by their units constructed of green and white card in a wide range of types for pendants, table lamps and bedlights. Hand painting in a variety of pleasing designs and colours, in conjunction with gimp trimming, is used to good effect in a number of models. Among the plain pendant shades is a useful design with an aperture on one side.

Transformer Lamp

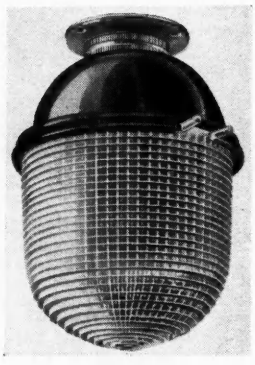
A low-priced transformer lamp consuming only 1 kWh for 60 hours' use is a product of V. & E. FRIEDLAND, LTD., 156-8, Fairfax Road, Harringay, London, N.8, that should facilitate considerably the A.R.P. lighting of shelters, cellars, passages, lavatories, bedrooms, nurseries, &c. The transformer reduces the mains voltage to 6 V and an ordinary cycle dynamo type 3-A lamp is used. The unit can be plugged in at any point on AC mains.

Friedland transformer lamp

The lamp is fitted with a black shade which throws the light downwards only, at just a sufficient intensity to enable a person to cross a room or move down a passage in comfort, but not brightly enough to show outside. When used as a second light in a normal room it enables the user to move about in an emergency, without having always to draw the blinds, which in the case of a bedroom at night make the room stuffy. Units with coloured shades are available if required.

Fittings for Shelters

HOLOPHANE, LTD., Elverton Street, Vincent Square, Westminster, S.W.1, has produced several units for the lighting of A.R.P. shelters, &c. One, which conforms with BS/ARP 6, is the neat "F9788" well-glass fitting, comprising a prismatic diffusion glass bowl and a metal canopy for attachment to any batten lampholder. It takes a 12-V, 10-W bus-type lamp with standard b.c. holder.



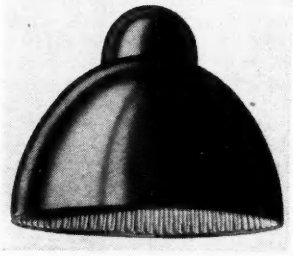
Holophane well-glass fitting for A.R.P. shelters

For buildings where headroom is restricted a semi-recessed unit has been designed, incorporating special glassware with prismatic interior and smooth fluted exterior to give a widely diffused illumination for such low mounting heights. Lamps of from 25 to 40 W may be used.

Another type of fitting suitable for either 40- or 60-W standard voltage or 10-W, 12-V lamps is the "Widerlite" bulkhead unit. This also has a very small projection and incorporates an interior prismatic reflector. The smooth front glassware is internally satin finished to give a soft but efficient light.

Industrial Lighting Fittings

A complete range of industrial fittings conforming with BS/ARP 16, 20 and 21 is also made by HOLOPHANE, LTD. The units made to the first two specifications are of the now more or less stereotyped design adopted to give illuminations of 0.02 and 0.002 ft.-candle over a wide area. They are intended for the exterior illumination of factory and railway yards, docks, &c., but can also be used for pilot lighting in factories to assist the evacuation of workpeople to air-raid shelters. In special cases the 0.002 ft.-candle models may be authorised to be left on even during a raid.



Holophane reflector conforming with BS/ARP 21

The units are constructed of heavy-gauge sheet-steel with cup and supports arranged to clip on the rim. The 1½-in. hole at the top enables the fitting to be fitted to a b.c. shade carrier lampholder. Three different finishes are used inside the reflectors so as to give the different candle-power intensities according to the mounting height.

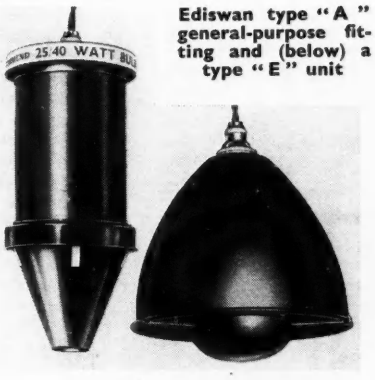
The third type of fitting, which follows the requirements of BS/ARP 21 and gives an illumination of 0.2 ft-candle, is of particular interest since its design differs from the others in that it comprises a one-piece opaque metal cover fitted over a prismatic reflector. Intended for covering loading bays, corridors, entrances, &c., where the light does not fall on the open ground, this unit gives an efficient and uniform light over an extensive area when spaced at a distance apart twice the mounting height above the floor. With this reflector it is possible to perform work on benches and platforms that could not be done with the lower intensity units.

The second of a series of A.R.P. lighting units, designed in accordance with BS/ARP20, is now available from the REVO ELECTRIC CO., LTD., Tipton, Staffs. This is the "IES/ARP.02" fitting which, taking a 100-W pearl lamp, cuts off all the upward rays from 5 deg. below the horizontal plane and distributes reasonably uniform light of a value not exceeding 0.02 ft.-candle over the ground.

Three designs are made, suitable for mounting heights of 10, 15 and 20 ft. The stove-enamel finish is matt black in the first type and battleship grey in the other two. Except that they are somewhat more conical, the fittings are identical in general appearance and design with the "IES/ARP.002" units described and illustrated in the ELECTRICAL REVIEW of September 22nd.

Two further units designed to conform with BS/ARP/16/20 and specially intended to provide very low levels of illumination over wide areas in open spaces such as goods yards, docks, pitheads, &c., are announced by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2. Type "D," which accommodates a standard 15-W pearl lamp and gives an illumination of 0.002 ft.-candle, can be left in operation even during an air-raid in certain circumstances. Type "E" takes a 100-W lamp and gives an illumination of 0.02 ft.-candle. Both fittings are made from heavy gauge metal, spray painted matt black or in two colours of grey, the colour of the fitting being dependent on the mounting height. The lower screening cup is arranged to clip on the rim of the shade.

In addition to these fittings the company has brought out two general-purpose A.R.P. shades. The all-metal type "A" unit, which is sprayed matt black inside and out, is of a conventional conical design and takes 15/25-W pearl or blue-sprayed lamps according to the location of fitting. Housing 15/40-W pearl lamps, the type "B" fitting has a metal body shaped so that the light is emitted only in the form of a narrow beam through the aperture of a blue "Celastoid" cone. In lateral directions a dim blue glow is emitted. To facilitate the installation of A.R.P. shades to existing fixtures having e.s. or g.e.s. holders a range of special adaptors is available.



Ediswan type "A" general-purpose fitting and (below) a type "E" unit

Another new "Ediswan" product is the "Industra" adjustable bracket. This is constructed of triangular steel members in which the flexible cable is enclosed. The joints are constructed to allow free movement of the arms but do not permit sagging from the position in which they have been set. The swivel joints fitted at the head and base of the fitting enable training to be made in any direction. The steel base-plate is designed for either wall or bench mounting and, in addition to having fixing holes, is drilled and tapped ready for fixing a conduit box and switch assembly. Either a pushbar switch or standard lampholder can be fitted to the enamelled reflector.

Simplex Fittings

A range of A.R.P. lighting equipment produced by the SIMPLEX ELECTRIC CO., LTD., Oldbury, Birmingham, includes a special reflector, the "L.10390," designed for use with 40- and 60-W blue sprayed or low-wattage clear lamps. The fitting has a deep angle of cut-off, preventing any direct light being visible from above, while the contour, in conjunction with the special semi-matt interior, gives a wide light distribution of low, well-diffused intensity.

Simplex "L 10390" A.R.P. reflector

By correctly spacing these units it is possible to provide any of the three classes of illumination now permitted by the Home Office. A g.e.s. to b.c. adaptor is also available, enabling the reflector and lamp to be screwed as one unit into the lampholder of existing high-wattage lighting fittings, thus permitting rapid conversion of large installations to comply with A.R.P. regulations. Over 30,000 of these reflectors have already been supplied to the Port of London Authority alone, besides large numbers to other docks, warehouses, &c.

An alternative Simplex system is the use of a range of deep blue visors with a special selective absorption. These can be fitted over the rim of any of the usual circular reflectors and, under approved conditions, allow the use of high-wattage lamps without permitting an intensity of illumination which is visible by aircraft. The company is also marketing several other A.R.P. fittings for use with small lamps for light trenches, shelters, first-aid posts, &c., and for general emergency lighting systems fed from batteries in works, cinemas, theatres, hospitals, &c.

Illuminated Signs

To indicate whether shop premises, &c., are open, ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, have just brought out a "Realite" sign designed so that when used with a 5- or 15-W lamp, which is arranged in a cowling above the actual sign portion, a limited amount of light is thrown through a blue visor screen on to the letters "OPEN," there being an entire absence of back reflection. The fitting is produced from heavy-gauge sheet steel, and fixing straps and suspension loops provide alternative methods of mounting. A similar but larger sign is available for indicating A.R.P. shelters, &c.

R.E.A.L. "Open" sign

Another fitting is an illuminated cash pedestal for the use of the small shopkeeper who has been unable to provide a light lock in his doorway. A 15-W lamp not only illuminates the sign portion of the unit, *i.e.*, the word "CHANGE," but a certain amount of light is also directed on to a specially constructed louvre at the back, so illuminating the till itself.

BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2, are also offering an illuminated shop sign of the glass fronted metal type, with the word "OPEN" in 5½-in. blue letters on a black background. The outside measurements are 11 in. by 9 in. by 6 in., the last dimension including a hood which projects about 2½ in. beyond the glass front. The inside of the sign is painted white to ensure the maximum illumination from a very low wattage lamp.

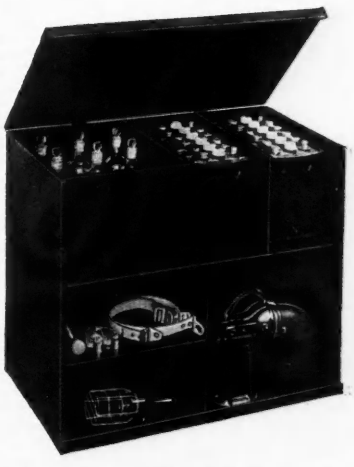
Brown Brothers illuminated shop sign

A screened ventilator is built into the back of the case and a suspension lug is riveted to both sides, enabling the unit, which weighs 4 lb., to be suspended from the ceiling block from which the supply is taken. Hood and glass are removable to give access to the lamp. The sign is supplied complete with lampholder, flex and b.c. adaptor.

Shelter Lighting

A complete range of A.R.P. shelter lighting equipment complying with the specification prepared by the British Standards Institution for the lighting of shelters for fifty persons and upwards has been designed by CRYPTON EQUIPMENT, LTD., North Acton Road, Park Royal, London, N.W.10. For shelters where mains supplies are available, the apparatus is arranged so that ten light points are connected with the mains through a transformer.

In the event of any failure of the mains supply a change-over switch connects a circuit of five lamps to a battery unit comprising two lead-acid or alkaline batteries, each of 12 V, 55 Ah at the 20-hour rate. (If the installation includes a battery charger, only one battery is required and this can be charged at any convenient time.)



Crypton A.R.P. shelter battery unit

The battery unit provides 18 hours' lighting at full load of four lamps, or twelve hours at full light and a further 12 hours at half light (two lamps). Its wooden case, which incidentally can be used as a seat, is fitted with compartments not only for the batteries but also for the electrolyte, hand lamps, spares, night lights and other requirements. A compact battery charger is supplied operating direct from single-phase 200/230-V mains.

QUALITY OF SUPPLY

I.E.E. North-eastern Centre Chairman's Address

As the basis of his chairman's address to the I.E.E. North-Eastern Centre, which was delivered at Newcastle-on-Tyne on Monday, Mr. H. G. A. Stedman chose those aspects of electricity supply that are not immediately connected with its cheapness or abundance. He dwelt especially on the need to meet the reasonable requirements of consumers in regard to safety from shock, fire and mechanical accidents, continuity of supply, voltage regularity, prompt, intelligent and well-informed service and strict attention to amenities. The address was illustrated by lantern slides, but certain technical data and figures of costs that had been collected could not be used on account of war-time considerations.

In regard to safety, he wished that the I.E.E. Wiring Regulations were compulsory. The N.E.S. Co., for its hired-wiring schemes, issued a specification to contractors and employed inspectors to visit work in progress; the best contractors welcomed this supervision. A great obstacle to safety was, however, unreported extensions by consumers. Although the risks in public buildings were generally slight, as the installations were supervised by independent officials, temporary connections were too often allowed to remain. Portable radiators should be prohibited in such places and more extensive use should be made of pilot lights supplied by trickle-charged batteries.

Mr. H. G. A. Stedman

Electricity on Farms

The best means for protecting persons and cattle on farms from shock was still debatable. Earthing of all-metal enclosures of wiring apparatus being often difficult, reliance should be placed on the use of the highest class of insulation without earthing or on transformation to a low voltage. Wiring for washing machines was often found to be unsafe. Possibly in the near future it would be made obligatory on undertakings to inspect installations periodically and on consumers to rectify any faults found. It was short-sighted policy not to discuss with consumers the risks attendant on the careless use of electricity.

The use of electricity has, in Mr. Stedman's experience, developed more quickly than the general technique of supply. He pointed out that while the importance of low capital expenditure, especially to rural consumers, was often emphasised in official reports and documents and elsewhere, quality and low maintenance costs had received little attention.

Generally speaking, the purchasing power of the individual was not uniformly less in non-urban districts. Prospective consumers must be offered quality by duplication or undergrounding so that they learned to rely upon the public supply. Thus, incubators up to 24,000-egg capacity and hatching some 7,000 chicks per week were providing good load factors in sparsely populated districts, but they added to the anxieties of distribution when supplied from single overhead lines.

Possibly the importance of connecting numbers of consumers in the shortest possible time had been over-emphasised to the detriment of a policy of reasonable progress coupled with consolidation of the ground won. The number of kWh sold per kW connected was to be regarded as a truer indication of real development than the number of connections or kWh sold per head of population.

Sales engineers should explain to consumers not only the high cost of reliability, but also the effect of extraneous costs imposed on the supply industry, *e.g.*, road charges, wayleaves and local rates (the last generally about 8 per cent. of the total costs) together with increasing taxation and legislative requirements, amounting to a cost per kWh sold that was out of all proportion to the generating costs.

Referring to the permissible voltage variation of ± 6 per cent., he pointed out that no limit was prescribed to the rate of change, yet rapid fluctuations well within the letter of the Regulations might be more annoying than wider, but more gradual, variations. One of the first essentials to provide steady voltage at each consumer's terminals was to maintain straight-line regulation at key-points on the high-voltage system, the principal considerations being system layout, type of load and the loading conditions.

Voltage Regulation

On the interconnected high-voltage system of the N.E.S. Co. there were 1,650 transforming stations feeding 1,007 separate networks. Except for twenty-six low-voltage regulators and on-load tap changing equipments on network transformers, regulation on the high-voltage system was carried out by the central control office from a schedule derived from loading conditions and voltage records at different times of the day and year on the various sections.

Main bus-bar regulation at the power stations was automatic over periods related to this schedule. More important regulators at main centres were operated by supervisory equipment from the system-control room and the others by sub-station attendants with automatic operation for regulators and on-load tap-change equipment on tail-end supplies. Continuous indication of voltage was given in the control room from twenty-one regulation points while supervisory equipment gave also the feeder and transformer loadings and tap-position indications and controlled the tap changes and also selected circuit-breakers in thirteen main sub-stations.

Further check on voltage conditions was provided by continuous voltage recorders at eighteen points. From area diagrams of voltage zones coloured according to the transformer tappings connected, the tappings to be used when connecting new transformers could be decided.

For the 1,007 low-voltage networks, serving some 270,000 consumers by 110,000 overhead and 160,000 underground services, the m.d. at the sub-stations was usually returned fortnightly with the maximum phase loadings on feeders. Voltage recorder tests were taken over two or three days in the winter at the sub-station low-voltage busbars and at one or more tail-ends. The data so obtained were used in connection with records of distribution connections in each phase for every class of load. Approximately 1,000 routine low-voltage 48-hour charts were taken between September and May, entailing the use of one light van, two testers and eighteen recording voltmeters. The section kept fully engaged nine engineers, two technical clerks and seven girls. Only one voltage complaint was received per annum per 6,750 consumers.

In conclusion, Mr. Stedman gave three examples of the way in which technique lagged behind load development. The first was in the need for insulation which would not deteriorate under heat or mechanical and electrical stresses and which was completely non-hygroscopic. Another was the control of lightning effects. The third related to low-voltage system earthing and he regarded the simplest solution as undergrounding with the use of cable sheaths earthed at numerous points; for overhead networks a continuous earth wire earthed at numerous points would provide the best method.

Radio Research in Australia

THE Council for Scientific and Industrial Research in the Commonwealth of Australia points out that three-quarters of the cost of its Radio Research Board's investigations is contributed by the Postmaster-General's Department. The Universities of Sydney and Melbourne have provided laboratory facilities, the Department of Defence has lent apparatus and assisted in other ways, and the Commonwealth Solar Observatory is co-operating in certain of the investigations.

The Council's latest bulletin No. 127 (the Board's report No. 14) contains three short papers, one of which supplements in more detail information previously given about the duration, activity and distribution of sources of atmospherics, particularly in the north-eastern portion of the continent. An estimate of the probability of aircraft encountering thunderstorms when traversing specified air routes has been calculated.

A second paper describes, with circuit diagrams, an aperiodic amplifier for investigating the wave-form of atmospherics. In this connection the third paper describes how the modulating electrode of television cathode-ray tubes has been employed for visual and photographic observation of non-recurrent transients.

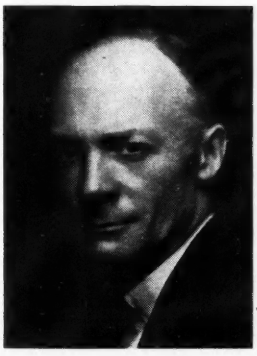
I.E.E. Benevolent Fund

AT the opening meeting of the North Midland Centre of the I.E.E., held at Leeds last Saturday, Mr. Longman announced that he had received for the Benevolent Fund a cheque for £66 the proceeds of the annual golf tournament held in June last. He thanked all those who had assisted in raising this record sum, and especially Mr. J. H. Jones (G.E.C.) and Mr. F. Gurney (Metro-Vick), the hon. secretary and hon. treasurer.

THE ENGINEER'S MENTALITY

Mr. W. Holttum's Address

AT the first of a few meetings that are to be held by the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers, Mr. W. Holttum, the chairman, delivered his inaugural address, which is to be repeated at an informal meeting at Chester, on the subject of "The Mentality of the Engineer." His remarks were directed mainly to the actual rather than to the ideal, and to the intermediate rather than to the higher administrative scale.



Mr. W. Holttum

The mental quality most naturally to be attributed to the engineer was that of mechanical ingenuity or constructiveness. This was a peculiar gift, distinct from reasoning power, though reinforceable by it, and might be described as the intuitive realisation of the mechanical possibilities of the association of an assembly of parts. Constructiveness was to machines what reasoning power was to knowledge.

The advance of engineering and allied sciences during the present century had resulted in such an accumulation of experience that its co-ordination for the guidance of further work had become a very serious problem. While the most useful kind of knowledge was to know how to find out anything that might be required, yet there must be some retention of the knowledge obtained in order to make use of it and to relate it to the situation in hand. Related knowledge was both the most useful and the most easily retained, and, while the mechanical use of records would enable the most complicated work to be repeated, the accumulation of knowledge within one mind was obviously essential to new development, and for this there must be memory.

But a mind guided by memory with little original thought was essentially conservative, a quality, at any rate, more reliable than mistaken judgment from faulty reasoning or insufficient knowledge. So memory alone, combined with very moderate other qualities, would go a long way in professional success, but was only the starting point for original work. Between the uses of records and memory lay the advantage of reference to another brain having information responsively available from any angle, and the highest efficiency of the individual was usually associated with such co-operation. While no two people could see any situation identically, the contributions of other individuals might yield something of value unobtainable in any other way.

The efficient engineer required by some means to take account of available experience, and to this end it frequently happened that the right approach to a problem was of more importance than previous knowledge, which must almost inevitably be incomplete. The extent of possible knowledge was so far beyond the scope of any one mind on account of lack of means or opportunity to gather it that any action taken by an individual was unlikely to take account of all relevant matters, and so might be or was even likely to be to some extent miscalculated. The escape from this somewhat depressing conclusion lay in the importance of personality, in the expression of which the chief value of any action resided.

The qualities which, with training and application, made a competent engineer were not easily defined. First, perhaps, was the ability accurately to assess needs and means and to take account of all the relevant factors in equating the one to the other. And if to that was added personality, the capacity for fitting into the human organisation, and impelling it by an individual contribution, then one should have a fairly complete engineer. But the analysis of such composite qualities was not easy, for they might be composed in various ways. The less complex qualities of industry—perseverance, idealism, judgment, memory, and willingness to take responsibility—found scope in all occupations. The engineer was one who was impelled to employ those qualities in a particular direction. And this impulsion in most cases came from the instinct of mechanical constructiveness possessed by the large majority of engineers, not because each found scope for it in his particular line, but because it was the cause of the choice of profession which he had made. And, having made the choice, in many cases the capacity might fall into disuse (though retaining some directive value) due to the many ramifications which limited the association of the engineer with the material expression of his work.

In making decisions, however, all mental powers were called into play, particularly as it was frequently necessary to act on evidence less complete than would be desired. Then came the opportunity for judgment, which must balance the probability of success against the possible consequences of failure. Here was a point at which progress and prestige were sometimes at variance, for it might require an unusual devotion to be willing to give progress its opportunity at the risk of personal failure.

Turkish Electrical Imports

RECENT events, including the signing of the Anglo-Turkish treaty and the negotiation of substantial credits, impart considerable interest to the figures relating to the electrical import trade of our new ally which have recently been issued.

These relate to the year 1938 and show the principal suppliers, with an indication of the increase or decrease compared with 1937. It will be seen that there was a very substantial upward movement in which this country shared. Although Germany retained her position as the principal supplier of electrical goods, Great Britain increased her share in considerably greater proportion—a trend which should now be accelerated. The rate of exchange in 1938 was about £T6 to the £ sterling.

	1938 £T000	Inc. or dec. on 1937 £T000
Wireless telephone receivers, transmitters, etc.—		
Total	1,172	+ 514
From United Kingdom	223	+ 172
,, Germany	292	+ 227
,, Holland	228	+ 64
,, United States	328	+ 3
Dynamos, motors, transformers, convertors, etc., 10 kg. and under—		
Total	403	+ 112
From United Kingdom	55	+ 39
,, Germany	221	+ 31
,, United States	76	+ 24
Ditto, 10–50 kg.—		
Total	326	+ 79
From United Kingdom	45	+ 44
,, Germany	198	+ 27
,, United States	49	+ 13
Ditto, 50–1,000 kg.—		
Total	855	+ 214
From United Kingdom	198	+ 180
,, Germany	457	+ 87
,, Sweden	48	+ 18
,, Switzerland	45	+ 18
Ditto, 2,000–5,000 kg.—		
Total	245	+ 78
From United Kingdom	152	+ 152
,, Germany	51	— 76
Ditto, over 5,000 kg.—		
Total	456	+ 365
From United Kingdom	370	+ 370
,, Germany	71	+ 23
Telegraph apparatus—		
Total	43	+ 24
From Germany	21	+ 4
,, Hungary	17	+ 17
Telephone apparatus—		
Total	247	— 6
From Germany	85	— 54
,, Sweden	97	+ 62
,, Hungary	18	— 10
Wireless telegraph apparatus—		
Total	23	+ 14
From Germany	6	+ 3
,, United Kingdom	12	+ 9
Röntgen apparatus and accessories—		
Total	157	+ 32
From Germany	112	+ 28
,, United Kingdom	29	+ 8
Electrical medical apparatus—		
Total*	61	+ 10
Accumulators and spare plates—		
Total	120	+ 57
From Germany	72	+ 50
,, United Kingdom	14	+ 12
,, United States	26	— 3
Dry batteries—		
Total	254	— 11
From Germany	245	— 3
,, United States	5	— 12
Electrodes—		
Total	66	+ 39
From Germany	45	+ 21
,, United Kingdom	7	+ 7
Wire and cable insulated with rubber—		
Total	170	+ 30
From Germany	92	+ 11
,, United Kingdom	24	+ 23
,, Italy	40	+ 5
Ditto, with silk—		
Total*	5	— 1
Ditto, armoured—		
Total	501	+ 13
From Germany	369	— 85
,, United Kingdom	79	+ 77
,, Italy	30	+ 8
Incandescent lamps—		
Total	467	+ 88
From Germany	215	+ 89
,, Hungary	86	+ 37
,, Japan	10	+ 2
,, Holland	36	— 24
Porcelain, electrical, and parts—		
Total	164	+ 58
From Germany	153	+ 62

* Mainly from Germany.

COMMERCIAL and INDUSTRIAL NEWS

"Ekco" Lamp Marketing Policy. C.M.A. Trade Mark Action. Contracting Industry Wage Increase. Grants for A.R.P. New Zealand Import Restrictions.

"Ekco" Lamps

A SHORT time before the war E. K. Cole, Ltd., announced their intention of introducing electric lamps of their own manufacture. In spite of subsequent events they are going ahead with their plans and production is now well under way. An independent marketing policy is being pursued under the direction of Mr. S. W. Fuller, lamp sales manager. The company claims that its lamps are of a high quality conforming to B.S. Specifications and its sales arrangements embody a stable fixed-discount distribution scheme; equitable and competitive prices and discounts; and vigorous sales promotion support. A wide variety of lamps—domestic and industrial—is being produced, including decorative and strip lamps, anti-vibration types, special high-voltage lamps and A.R.P. "Blulites." Arrangements exist for stringent testing of all types.

"Ekco" lamp cartons

The company states that all distributors will be granted a standard discount until authentic turnover figures are shown to justify increased allowances. The latter will be graded on a fixed scale designed to represent the actual marketing savings due to bulk purchase. The standard initial distributors' discounts will apply to all purchases. If at the end of a full year's trading a nominal quota has been achieved a cash bonus will be paid. Retrospective rebates will also be granted according to a fixed scale of turnover gradings which can be improved from year to year and will each time carry the cash bonus. We illustrate the distinctive orange and black carton used for the lamps which are now being distributed. A wide range of sales aids is to be released in the near future. The company emphasises that although prices are favourable it is not entering the "cheap" lamp market. Inquiries should be made to the company's Lamp Department, Southend-on-Sea.

Cable Trade Mark Litigation

An action by British Insulated Cables, Ltd., and Callender's Cable & Construction Co., Ltd. (as members of the Cable Makers' Association), against the Progress Cables & Accessories Co., Ltd., came before Mr Justice Crossman in the Chancery Division on October 20th on a motion for an injunction until the trial, restraining an alleged infringement of the trade mark "C.M.A." on labels.

Mr. A. de W. Mulligan, for the defendants, said that without any admission as to liability they had offered to give a perpetual undertaking in the terms of the notice of motion. The plaintiffs, however, wanted an injunction. The defendants were prepared to treat the motion as the trial of the action, submit to a perpetual injunction, and delivery up of all labels which constituted an infringement of the trade mark. The defendant's cables did not contain any reference to the trade mark. The defendants would also pay the taxed costs of the action.

Mr. Basil Drewe, for the plaintiffs, said they did not ask for an inquiry as to damages.

His Lordship granted a perpetual injunction against the defendants with an order for delivery up of the infringing labels and the usual order as to costs.

Birmingham Wholesalers' Hours

The Birmingham members of the Midland Section of the Electrical Wholesalers' Federation have agreed, in collaboration with other electrical bodies in the city, to introduce the following working hours from November 6th: Mondays to Fridays, 8.30 a.m. to 5 p.m.; Saturdays, 8.30 a.m. to 12.30 p.m. This arrangement will remain in force for at least two months.

Wages in the Contracting Industry

The National Joint Industrial Council for the Electrical Contracting Industry has had before it (*inter alia*) the question of making some cost of living (war) adjustment to the existing wages agreement, and the National Federated Electrical Association and the Electrical Trades Union have agreed that, pending further consideration of the problem, there shall be no disturbance of the existing national standardised wages agreement. They have furtheragreed that an additional payment of 3s. 6d. per week shall be made commencing on the second pay day in November for the pay period covered by that pay day. This payment is intended to be a cost of living (war) addition, and will apply to all journeymen electricians and assistants over twenty-one years of age irrespective of the hours worked, provided that the full additional payment of 3s. 6d. per week shall be made when the period of employment is not less than three days in any one week. For periods of less than three days in any one week payment shall be made at the rate of 7d. per day.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted: E. C. Bullock, Macclesfield; L. Martin, Edgeley, Stockport; Glasgow Electrical Engineering Co., Ltd., Glasgow, C.2; Pemberton & Sturgess (Great Britain), Ltd., 136, Cromwell Road, South Kensington, London, S.W.7; Lund Bros. & Co. (Streatham), Ltd., 55, Bendon Valley, Earlsfield, London, S.W.18; and W. A. Rimmer, Hutton, nr. Preston.

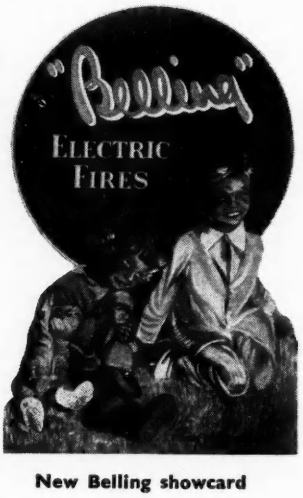
A.R.P. Grants

The Minister of Home Security announces that his Department is ready to receive applications for the payment of the Government grant provided under Section 22 of the Civil Defence Act, 1939, to occupiers of factory premises and owners of commercial buildings in the specified areas who have completed the provision of air-raid shelter in fulfilment of their obligations under the Act. Forms on which grant may be claimed have already been issued and may be obtained by occupiers of factory premises from the district factory inspectors, and by owners of commercial buildings from the local authority of the area in which the building is situated.

Applications by persons in the specified areas employing not more than 50 workpeople who have provided shelter for their employees and by persons outside the specified areas who provided shelter for their employees before the passing of the Civil Defence Act, should be made on special forms obtainable from the A.R.P. Department, Cleland House, Page Street, London, S.W.1. A large number of claims is anticipated, and it would materially assist the Department if application by those who have completed their shelters is made as soon as possible. Applications for grant will be dealt with in rotation.

Electric Fire Showcard

Now that the restriction on the consumption of electricity has been relaxed, there will no doubt be a better demand for domestic electrical appliances and apparatus than has been experienced in the past few weeks, and owing to the necessity of conserving coal supplies, the sales of electric fires, in particular, should show an upward trend. The production, therefore, by Belling & Co., Ltd., of a new showcard drawing attention to their electric fires is opportune. The showcard is in warm colours and the representation of two children reflecting the glow from an electric fire has an appeal which should prove a valuable sales aid.



New Belling showcard

Employment in September

The numbers unemployed in the engineering industry between August 14th and September 11th showed a further fall. According to the *Ministry of Labour Gazette* the percentage unemployed among insured persons in the engineering industries as a whole (excluding motor vehicle, cycle and aircraft manufacture) was 3.8 at September 11th as compared with 4.6 per cent. at August 14th and 8 per cent. at September 12th, 1938. In electrical engineering the number out of work was 2,993 or 2.5 per cent., a decrease of 0.4 per cent. as compared with the preceding month and a fall of 2.8 per cent. as compared with the corresponding period of last year. The unemployed in the electrical wiring and contracting industry totalled 2,907, the percentage falling from 8.4 to 6.8 as com-

pared with the previous month (10.4 per cent. in September, 1938). In the electric cable, apparatus, lamps, &c., group there were 7,785 unemployed, or 4.3 per cent., an increase of 0.3 per cent., as compared with the previous month, but a decrease of 2.5 per cent. as compared with September, 1938.

E.A.W. Activities

The London Branch of the Electrical Association for Women has arranged to hold meetings monthly at the Clubroom, 20, Regent Street, S.W.1. The first will be this afternoon (Friday) when Mr. P. L. Oliver will talk on "The Story of Blood Transfusion." On November 8th there will be a one-day London & South-East Area Conference and business hour luncheon at which the speakers will be Mr. V. W. Dale ("Electricity in the Home in Wartime"), Miss Ellen Wilkinson ("The Hire-purchase Act in Wartime"), and Miss D. Vaughan ("The Economical Use of Domestic Apparatus"). "Housekeeping in America" will be the title of a lecture by Mrs. B. Jolley on December 8th.

Petrol for Manufacturers' Agents

The Manufacturers' Agents' Association of Great Britain & Ireland (Inc.) has been actively engaged in endeavouring to obtain adequate supplies of petrol for members who use their own cars to carry on their business. To this end Mr. H. Edward Jowsey, a vice-president of the Association and a member of the Court of Common Council, London, has attended conferences at the Mines Department. The outcome of a conference attended on October 16th was that the Association was promised that manufacturers' agents should be given special consideration. The Secretary for Mines explained that membership of the Association would be accepted by the district petroleum officers as a guarantee of the bona fides of an agent applying to them. Any provincial member of the Association desirous of representing the Association on the local petroleum panels which will be set up to advise district officers regarding extra supplies to be allowed should write to the head office of the Association at 6-7, Queen Street, Cheapside, London, E.C.4.

Fire at L. G. Hawkins' Premises

On October 17th the new building at Tileyard, Kings Cross, of L. G. Hawkins & Co., Ltd., was completely gutted by fire, thus affecting their factory, warehouse and service departments. We are informed that while temporary inconvenience will be caused to customers, every effort is being made to re-establish quickly the company's normal service. All communications should be addressed to the head offices and showrooms at 30-35, Drury Lane, London, W.C.2.

Lamp Makers' Wage Increase

Ensign Lamps, Ltd., of Preston, has decided to raise the wages of all employees in order to meet the higher cost of living. The whole of the staff will benefit substantially from this arrangement, which takes effect as from October 19th. Those members of the staff earning 50s. per week or less receive an increase of 10 per cent. and all above this figure will be paid an extra 5s. weekly.

Birmingham Electric Club

While in view of the present conditions the usual activities of the Birmingham Electric Club have been suspended, the Emergency Committee arranged a luncheon at the Grand Hotel which was held on October 20th. About 200 members and friends attended, and a number of applications had to be refused as the available accommodation was limited. The president, Mr. J. Hamilton, was in the chair and in welcoming those present indicated that it was proposed to hold another luncheon before Christmas, should the conditions permit. He announced that a nominal subscription of 2s. 6d. would be instituted while hostilities lasted, while those serving in the Forces would not be called upon to pay anything.

French Trade with Argentina

A *Reuter* message from Buenos Aires states that the Argentine Government has come to an agreement with the French Commercial Attaché for the unlimited exchange of goods for French exports. These exports will include fuel, lubricants, wireless and electrical apparatus, metals and machines (with the exception of agricultural machines).

The "Mary Ann" Iron

British Electric Domestic Appliances (1938), Ltd., announces that early in November it will be releasing the new "Mary Ann" double-way automatic electric iron, AC model. This will be available in three colours, namely, cream, pastel green and powder blue, and will be supplied complete with asbestos lined, metal stand and wire frame flex-tidy.

New Zealand Import Restrictions

A *Reuter* message from Wellington (N.Z.) states that New Zealand's imports for the third licensing period, January to June, 1940, are to be restricted to a greater degree than formerly owing to existing circumstances. In making the announcement Mr. Nash, the New Zealand Finance Minister, says that various factors have caused an additional drain on sterling, but arrangements are being made for the import of sufficient goods to meet all requirements. The policy of granting maximum preferences to Britain is to be continued, but if war prevented the importation of supplies from Britain, then preference would be given to some other Dominion.

Mr. Nash expressed confidence that the difficulties would be overcome in a comparatively short time. It had been hoped that the reduction of certain imports in the present period would have had the effect of improving the relationship between imports and the sterling funds available from exports, enabling some relaxation of restrictions to be made in the next period. Unfortunately, however, circumstances had arisen which made any relaxation impossible. In the meantime, it was necessary to effect a further reduction of imports and tightening of restrictions in order to grant maximum preference to Britain and conserve sterling exchange. Restrictions had been applied to the importation of goods previously admitted from all countries on the same basis as from Britain, while in other cases restrictions had been increased.

A 50 per cent. cut in British imports had been made in the quotas of a variety of goods including electrical apparatus and lamps, while a complete embargo had been placed on other items including radio sets and accessories, vacuum cleaners, electric cookers, oil engines and boilers.

Welding Lantern Lectures

An instructive series of lantern slides, describing a wide range of repairs to motor vehicle engines, industrial machines, machine tools, and other damaged parts, has been prepared by Barimar, Ltd. The slides, with full text of lecture, will be lent free of charge to technical schools, institutes and engineering societies. Applications, with suggested dates, should be sent to Barimar, Ltd., 14-18, Lamb's Conduit Street, London, W.C.1.

A Library Lighting Installation

A fine example of modern interior lighting has just been completed in the spacious library of Queen's College, Oxford. The library, designed by Christopher Wren and Nicholas Hawksmoor, was built under the supervision of Timothy Halton, the Provost of the College, nearly 250 years ago. The accompanying illustration of the interior shows the library as it is to-day. The reading desks with which it was originally equipped were removed in the middle of the nineteenth century and more modern bookstacks substituted to provide accommodation for additional books. The ceiling, carved by

Library of Queen's College, Oxford, illuminated by "Osram" lamps and G.E.C. reflectors

Roberts, is one of the outstanding features of the interior architecture.

The general lighting is on the indirect principle with the sources completely screened. Reflectors are recessed into the tops of the bookstacks in pairs, each reflector being equipped with a 100- or 150-W lamp, and covered by a heat-resisting glass dust cover. Such a form of lighting is found to throw into relief the intricacy and beauty of the ceiling to better effect than daylight, and at the same time to provide an efficient and uniform illumination throughout the library. For local lighting, study lamps are mounted on the tables and above the desks between the stacks, each equipped with an Osram 100-W lamp. The installation was carried out by Fred G. Alden, Ltd., of Oxford, in collaboration with the illuminating engineers of the General Electric Co., Ltd.

Fatalities

An inquest was held on October 19th on Leonard Arthur Davies, aged nineteen, a Cardiff youth, who was found dead in the bath at his lodgings. An electrical expert said that when a lamp was pushed into a lampholder over the bath

it caused the outer case to become "alive." He expressed the opinion that Davies had made contact with the holder while he was drying himself after the bath. Recording a verdict of "Accidental death," the coroner remarked upon the importance of seeing that electrical appliances in bathrooms were correctly fitted and out of the reach of anyone using the bath.

A verdict of "Accidental death from asphyxia following electrocution" was recorded by Mr. Ingleby Oddie at an inquest held in London, on October 18th, on Mr. Cecil Le Fleming Biggs, of Ralph Court, Bayswater. Norman Donald, a son-in-law, giving evidence, said that Biggs had been mending an electric fire, the "flicker" of which was out of order. On returning from a cinema his mother-in-law saw her husband lying on the floor with the fire on his chest and his right hand grasping the live wire. She tried to pull the fire away from him and received a shock. William J. Dawson, electrical inspector, said that he examined the fire and installation and found that they were both in perfect accordance with the Electricity Commissioners' regulations. He put forward the theory that Biggs, having successfullly effected the repair to the flicker, switched on to check his work, touched the live wire, and another part of his body inadvertently coming into contact with another part of the fire completed the circuit.

Frederick William Unwin (aged 27), of New Barking, recently received a fatal electric shock while fixing a temporary light in an air-raid shelter. At the inquest held on October 16th Robert E. Grover, an electrician's mate, said that Unwin attempted to cut an electric cable with a pair of pliers, and as he did so screamed. Witness ran to the switch but found that it was off. Alexander J. Escott, director of the firm by whom Unwin was employed, said that apparently the man had worked from the source of power to the temporary connection instead of working from the "dead" lamp to the supply. A formal verdict was returned.

Industrial Lighting Fittings

A review of the application of "Philora" electric discharge lighting under wartime conditions has been received from Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London, W.C.2, special attention being drawn to the complementary colour sodium lighting system.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price October 25th	Fortnight's inc. or dec.
a Acid oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¾d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	1/0¼ to 1/0¾	—
c ,, Wire, basis ... ... ,,	9¼d.	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/1¼d.	—
g ,, Bars (best selected) ... ... per ton	£86	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£51	—
d ,, ,, Wire Rods ... ,,	£55	—
d ,, ,, H.C. Wire ... per lb.	8¼d.	—
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/3 +10%	—
f ,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8 adv.	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	11d.	—
g Lead, English Pig ... ... ,,	Nom.	—
g Mercury ... ... per bot.	Nom.	—
e Mica (in original cases) small ... per lb.	1/3 to 3/–	—
e ,, ,, ,, medium ... ,,	9/– to 18/–	—
e ,, ,, ,, large ... ,,	20/– to 27/6	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/2	—
p ,, ,, rolled strip & sheet ,,	1/–	—
p ,, ,, wire ... ... ,,	1/2	—
o Platinum ... ... per oz.	£10	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£15	—
g Tin, Block (English) ... ... ,,	£230	—
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

Heat Insulating Terms

The British Standards Institution has just issued definitions of heat insulating terms and methods of determining thermal conductivity and solar reflectivity, B.S. 874. The aim in the preparation of the symbols has been to put forward a consistent terminology which should conflict as little as possible with that in use in other countries, with a view to clearing up the present confusion in many of the terms used. Copies of this specification may be obtained from the British Standards Institution, Publications Dept., 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

Oil Fuel Heaters

In view of the fact that the Petroleum Pool Board authorities are now supplying a heavier oil for industrial users, special attention is drawn to the "Highlow" electric oil fuel heaters made by Archibald Low Electrics, Ltd. These heaters, which are of all-steel construction, are specially designed for fitting into main oil storage tanks in exposed positions and into daily oil supply service tanks, as well as for inserting into pipe-lines supplying oil to burners. They are also used for case-hardening, oil refining and purifying.

Temporary Removals

T. B. Morley & Co., Ltd., have removed their staff from Maidstone House, 25-27, Berners Street, W.1, and all communications should be addressed to the head office at Jameson Street, Hull.

The Rotoplunge Co., Ltd., has removed to 15, Friar Street, Reading.

Electric Heating

Wartime aspects of electric heating are dealt with in the October issue of "Thermovent News," issued by E. K. Cole, Ltd., Southend-on-Sea. The contents are sub-divided to deal with the heating requirements of A.R.P. shelters, first-aid centres, hospitals, record storage chambers, &c., while sections on domestic economy and emergency business accommodation draw attention to an effective answer to fuel economy problems. It is pointed out that consumption of all fuels can be saved by employing a system of "mixed" heating, with a simultaneous increase in efficiency. The value of thermostatic control is also emphasised.

Abrasive Papers and Cloths

British Standards have just been issued for abrasive papers and cloths, grouped into two reports. B.S. 871 deals with what are known in the trade as "technical products," for engineers, woodworking, &c., while B.S. 872 is for general purposes. It has not been found possible at this stage to include a comprehensive test for the quality of the finished product as there are insufficient data available to form the basis of test requirements.

New Catalogues and Lists

Howard Clayton-Wright, Ltd., Tiddington Road, Stratford-on-Avon.—An illustrated leaflet describing the "Clayflex" patented flexible pipe union.

Knightshades, Ltd., Derby Road Works, Montagu Road, Edmonton, London, N.18.—Leaflets dealing with the company's all-purpose reading lamp and a pin-up wall bracket.

James Beresford & Son, Ltd., Cato Street Works, Birmingham.—A folder (P.55) giving particulars of the latest "Beresford-Stork" fire-fighting pumps for A.R.P., &c.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—A 70-page publication (Ref. S.F.245) dealing with "Sirocco" air conditioning.

Ruston & Hornsby, Ltd., Lincoln.—A booklet entitled "Extra Power from Extra Air," dealing with the company's recently introduced range of pressure-charged oil engines.

Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.—A leaflet giving particulars of special lighting fittings for A.R.P.

Watford Electric Manufacturing Co., Ltd., Whippendell Road, Watford.—A booklet of interest to consultants, architects and engineers relating to fuel economy in heating installations, with special reference to the company's Watford-Pigral system of automatic control.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

BEAVER hotplate.
Self-generating torch (suppliers).
COLUMBIA iron.
C.A.S. battery hand lamp.
HASLER revolution counter.

ELECTRICITY SUPPLY

Proposal to Continue Hire-purchase at Bradford. Croydon Scheme Approved. Electric Cooking for "Evacuees" at Eastbourne.

Barnes.—THOUGHT FOR CONSUMERS.—While pointing out that the decrease in consumption, together with the rise in the price of coal, demanded an immediate increase in the electricity charges, the borough electrical engineer recently recommended that, in view of the national emergency and the difficulties of many consumers, no increase should be made during the current financial year. This was approved by the Council, which will review the position next April.

Bedford.—HOUSE SERVICES.—The Electricity Committee has discontinued, for the time being, laying services free of charge on consumers' premises.

Birkenhead.—LOAN APPLICATION.—The Electricity Committee is seeking sanction to borrow £20,000 for mains and services.

Bradford.—JUBILEE YEAR.—Special interest attaches to the latest report of the Electricity Committee for the undertaking has recently reached the jubilee of its establishment. It is recalled that the Corporation was the first local authority in the world to give a public supply of electricity, commencing in the central portion of the then borough of Bradford on September 20th, 1889. The report provides an up-to-date guide to conditions in Bradford by including figures relating to the half-year ended September 30th last. These record an increase of approximately 5,000,000 kWh in the Department's output during the six months compared with 7,525,000 kWh in the twelve months ended March 31st last so that, taking into account the restrictions during September, a substantial improvement must have taken place up to the time of the outbreak of war. If the experiences of the 1914-18 war are any criterion, it is anticipated that the output for motive power will increase, but at present no estimate can be made of the extent of such increase, if any. Apart from the effects of the rationing scheme and the curtailment of the Department's activities in the provision of installations and apparatus on hire and hire purchase, the consumption of electricity by the trams and trolley-buses has decreased owing to the reduced services at night, while the street lighting load has been lost. It is confidently anticipated, however, that although decreases must be expected during the war, post-war years will again show a healthy expansion in the Department's business, as there has been no indication of anything approaching saturation point being reached.

CONTINUATION OF HIRE-PURCHASE RECOMMENDED.—At a meeting of the Electricity Committee the city electrical engineer reported upon the success which had attended the schemes for the supply of apparatus on hire-purchase terms and the undesirability of losing this class of business. The Committee expressed the opinion that the schemes should be continued; the question of financial arrangements would be dealt with by a sub-committee.

Brighton.—EXTENSION OF GENERATING STATION.—A report by the Electricity Committee states that a direction has been received from the Central Electricity Board for the extension of the Southwick generating station by the installation of one turbo-alternator set having a maximum continuous rating of 50,000 kW, complete with the necessary ancillary plant, and two boiler units each having a maximum continuous evaporative capacity of 350,000 lb. of steam per hour, complete with the necessary ancillary plant, together with the required buildings and civil engineering works. The estimated cost is £741,000, and it is desired that the work shall be completed by September, 1942. The Electricity Committee has recommended that, subject to a satisfactory reply being received from the Treasury as to raising the necessary funds, the direction of the Central Electricity Board shall be received and approved. The Finance Committee recommends that the matter should be deferred pending the receipt of a reply from the Treasury.

SUB-STATION SITE.—Subject to consent being received from the Electricity Commissioners to the purchase of property in Sussex Mews for the purpose of providing a further sub-station there, the Council has agreed to pay £550 for the premises.

Burnley.—RURAL SUPPLIES.—It was recommended at a meeting of the General Purposes Committee last week that an application should be made to the Electricity Commissioners for permission to borrow £2,500 to erect overhead lines for the supply of electricity to Briercliffe, Worsthorne, Hurstwood, and Habergham Eaves.

Cardiff.—STREET LIGHTING CONTROL.—The Works Committee has approved the estimate £3,737 of the city electrical engineer for the installation of a system of central control of electric street lamps.

SWITCHGEAR.—The Electricity Committee is to provide new switchgear at the switch-house at a cost of £4,261.

Chester.—A proposal of the Hawarden R.D.C. to erect a 33-kV single-circuit overhead line from Hawarden to Gell Farm, Lower Kinnerton, and a transformer station, in the Corporation's area of supply, has been approved by the Chester Electricity Committee.

Colwyn Bay.—DEFICIT ON UNDERTAKING.—A loss of £1,523 is recorded on the working of the electricity undertaking for the year to March 31st last. At last week's Council meeting Alderman Berth-Jones (chairman of the Lighting Committee) said that the undertaking had shown a substantial profit almost every year. The loss was accounted for by the reductions in the tariffs made at the beginning of 1938. Unfortunately, the hope that consumers would use more electricity as the result of the reductions did not materialise. After the crisis last year there was an increase in the consumption, but not enough to make up for the previous decline. The undertaking had a substantial reserve of £23,373. The committee had asked the borough treasurer to submit an interim balance sheet at the December meeting, and the engineer to submit revised estimates of expenditure and income for the current year.

Croydon.—POWER STATION SCHEME APPROVED.—The Electricity Committee has obtained consent to the establishment of a new power station and sanction to borrow £326,579 for the scheme. On September 14th the Electricity Commissioners held an inquiry into objections by local ratepayers against the erection of the station on the proposed site.

Darlington.—LARGE INCREASE IN DOMESTIC SALES.—During the year ended March 31st last the Electricity Department earned a surplus of £10,637 compared with £11,018 the year previous. The number of kWh sold was 59,500,000, an increase of 6 per cent. The proportionate increase among domestic consumers was 22 per cent. The annual report states there are now 2,130 cookers, 1,627 water heaters and 447 wash boilers on hire.

Dundee.—FIRE-EXTINGUISHING PLANT.—Permission is being sought by the Council to install an automatic fire-extinguishing system at Carolina Port generating station at a cost of £1,800.

Eastbourne.—COOKING FOOD FOR EVACUEES.—For some time the cooking of a mid-day meal for up to 100 evacuees was carried out at Electric House, the food being transported to the Salvation Army hostel. Cookers have now been installed at the hostel, and the food is cooked there by members of the women's voluntary services. In addition, cookers have been installed in some empty houses for the same purpose.

Ebbw Vale.—PROPOSED SUB-STATION.—At a meeting of the Urban District Council last week it was decided to apply for permission to borrow £6,000 for the erection of a sub-station.

Gainsborough.—AVOIDING LONG BREAKDOWNS.—Following three breakdowns in the electricity supply to Gainsborough, Lincs, due to failure of the bulk supply of the North Lincolnshire and Howdenshire Electricity Co., Ltd., Mr. H. Breckell, the electrical engineer, has taken up the matter with the company and has made certain suggestions regarding the modification of switching arrangements. Mr. Breckell considers that his suggestions will prevent breakdowns of such long duration, due to lightning discharge on the overhead cables.

London.—INCREASED PROFIT AT HACKNEY.—The Hackney Electricity Department is one of the few undertakings which is able to record an increased profit for the year ended March 31st last. Actually the amount was £29,610 against £15,291 for the previous year. Part of this higher profit was due to

National Service Register

ARRANGEMENTS are now well in hand for making full use of the Central Register for Voluntary National Service compiled by the Ministry of National Service and Labour with the co-operation of the Institution of Electrical Engineers and other scientific and technical institutions. The object of the Register is to ensure that wartime work requiring specialist qualifications is performed by those best fitted to undertake it, and employers engaged on projects of national importance are invited to apply to the above Ministry (Central Register), Montagu House, Whitehall, S.W.1, regarding openings for men with the requisite technical experience. A panel of experts will assist in selecting candidates who appear suitable for posts notified. Most of those whose names are on the Central Register are already in employment, and account will be taken of the national importance of work offered compared with that of present posts. No candidate's name will be submitted without his consent or without affording his present employer an opportunity of forwarding his observations.

tariff revisions. Among other changes, the domestic tariff based on lamps installed, which Mr. E. A. Mills, the borough electrical engineer, describes as unsatisfactory, was abolished and replaced by a tariff with the fixed charge based on floor area. Despite the higher charges the average price to consumers decreased from 1.34d. to 1.30d. per kWh, mainly as the result of the much larger domestic two-part tariff consumption, which increased by 22 per cent. during the year. A further 1,800 water heaters, 1,600 cookers, 1,750 fires, 450 wash boilers and 450 kettles were hired out by the Department in the period. Total sales of electricity amounted to 76.2 million kWh, compared with 68.2 million kWh in the previous year, an increase of 12 per cent. The number of consumers rose by 3,045 to 53,570. From the past year's net profit £14,545 has been allocated to rate relief.

Lossiemouth.—BULK SUPPLY ARRANGEMENTS.—It was reported at a recent meeting of the Town Council that the local generating plant was no longer able to cope with the demand and that an agreement had been drawn up under which a bulk supply would be taken from the Grampian Electric Supply Co. The agreement was generally approved, but sanction was deferred.

Stockton-on-Tees.—SUPPLY TO WORKS.—The Town Council has decided to enter into an agreement for the supply of electricity to the Malleable Works, Stockton.

Stoke-on-Trent.—DISTRIBUTION PROPOSALS.—The Electricity Committee is to extend the mains at a cost of £450 to supply eighteen houses being erected in New Avenue, Tunstall; to an estate at Little Chell, Tunstall (£300); St. Mary's Engineering Works, Booth Street, Tunstall (£530); and Park Hall, Longton (£2,250), for Hilton Gravel, Ltd.

Wick.—UNDERTAKING'S FINANCES.—Reporting on the electricity undertaking at a meeting of the Town Council, Bailie Miller said that the black-out had placed it in an unfortunate position for the current year; the estimated loss from street lighting alone was £900, with a loss of £600 through reductions in other supplies. A special assessment would have to be levied for electricity this year, he said, but it would be done without increasing the rates.

Overseas

Canada.—POWER FROM THE ST. LAWRENCE.—An Ottawa dispatch to the Toronto *Globe and Mail* states that there are strong indications that the Canadian Government will immediately reopen negotiations with the United States for the joint development of the St. Lawrence River as a new source of hydro-electric power, but it is not yet ready to make a formal announcement. The war has necessitated a large expansion of Canadian industry, hence the need for additional power supplies, the dispatch says. More than 1,000,000 HP could be obtained from the St. Lawrence.

Eire.—PROGRESS OF LIFFEY SCHEME.—The Liffey scheme above Poulaphouca Falls by which the waters of the Liffey and of the King's River tributary will be diverted into a 5,000 acre reservoir is nearing completion. The large concrete barrier for damming up the water is practically finished and the intakes are now approaching completion. About 500 men are working on the tunnel which is to convey the water from the dam to the power works, and the safety valves are in hand. The date of the formal opening has not yet been fixed. Three new bridges are nearly ready for use. Nothing has been done with regard to the suggested fish passes in the falls, which stop salmon ascending any further.

PROPOSED LIGHTING REGULATIONS.—Arrangements are now being completed for the provision of central switching systems for public lighting. This will obviate the necessity for reducing public lighting in Eire's scheme of air-raid precautions, and under the compulsory black-out order to be enforced in November the only restriction on public lighting is that all lamps must be cowled so as to avoid sky-glare. No light will be permitted inside private houses unless so obscured as not to be discernible at a distance of over 300 ft. Lights will be allowed in the display windows of shops where no direct glare is thrown on to the window glass, and advertising lighting and signs may be continued provided they are so situated or screened as to be invisible above the horizontal and at a greater distance than 300 ft. when viewed from ground level.

Italy.—POWER PRODUCTION PROGRESS.—The annual report of the Servizio Idrografico Centrale for 1938 shows that steady progress continues to be made in the electric power supply industry in Italy. At the end of the year there were 1,103 hydro-electric plants with a total capacity of 4,685,081 kW and 189 steam and oil-engined stations representing an additional 876,464 kW, the aggregate capacity being 5,561,545 kW compared with 5,219,000 kW at the end of 1937. Of the hydro-electric plant 4,437,000 kW of the total capacity was installed in 384 stations and there were 82 thermal plants (835,000 kW) with an individual capacity exceeding 1,000 kW. The quantity of electricity generated during 1938 is given as approximately 15,380 million kWh (14,559 million kWh water power), compared with 15,200 million kWh in 1937, an increase of 1.3 per cent. In addition, 163 million kWh was imported from neighbouring countries. It is stated that the annual consumption of power in the country now amounts to 362.4 kWh per inhabitant.

TRACTION

Brighton.—TRANSPORT SCHEME COMPLETED.—The transport manager has reported that the last trolley-bus was delivered just following the outbreak of war, and that the undertaking in its entirety so far as routes and services are concerned had been completely changed over within five months of the first motor-bus and four months of the first trolley-bus being put into service. He adds that the staff have worked with interest and enthusiasm and made what seemed impossible capable of practical solution in these unfortunate circumstances.

Russia.—PROGRESS OF "UNDERGROUND" EXTENSIONS.—About 2½ miles of the tunnel of the new Moscow underground railway has now been completed, learns *Reuter's Trade Service*. Twenty-two boring shields are working on the tunnel. The scheme, which is expected to be finished by the end of next year, consists of 8¾ miles of tunnel in two sections (Pokrovsky and the Zamoskvoretsky). The first section will have four new stations and the second three. It is stated that 200 million roubles is being spent on the project this year.

Italy.—ELECTRIFIED LINES.—A *Reuter* report from Rome states that Italy now has about 3,250 miles of electrified railway lines following recent progress with electrification schemes. It is now possible to go from Reggio di Calabria to the Swiss frontier on electrified lines. The total expenditure on railway improvements last year was 1,100,000,000 lire (about £13,750,000).

United States.—PHOTO-ELECTRIC TRAFFIC COUNTER.—Apparatus for automatically taking 24-hour traffic counts has been developed by the California State Highway Commission in collaboration with the International Business Machines Corporation. It is intended to reduce the cost and errors of manually operated counting, and works on the photo-electric principle, with two units installed at opposite sides of the road. One contains an ordinary 50 candle-power headlamp bulb, the light of which is directed through filters, and by mirrors, to form two parallel beams about three feet apart. The filters are designed so that the beams consist only of infra-red light, reducing the hazards which might be caused by visible light sources at night. The second unit comprises two photo-electric cells acted upon by the two beams. They are connected in parallel with a relay, operating a counting mechanism. If one beam is interrupted by a pedestrian, for example, the other beam will remain and so prevent the counter being operated. It is necessary for both beams to be interrupted simultaneously for the counter to work. This can only occur if the beams are cut by a vehicle. At the end of each hour a relay closes causing a stamp showing date, hour and number of vehicles counted to be printed on a strip of paper, which is immediately moved on so that at the end of the next hour the following count can be recorded. In practice, this apparatus has worked well and costs little to operate. One problem is that when a vehicle painted white or aluminium passes at certain hours of the day it is not counted because it reflects enough light to prevent the photo-electric cell delays operating. The error thus introduced into the count is, however, very small.

Battery Buses

THE possibility of battery vehicles being used for passenger transport was fully examined by Mr. W. Forbes, general manager, Cardiff Transport Department, in a recent report to the City Council. Mr. Forbes's conclusion was that battery propulsion would be possible for certain part-day services but impracticable for regular all-day services.

Owing to the limited mileage obtained on one charge from a battery of reasonable size, states the *Transport World*, changing over of batteries several times a day would be necessary, and the most convenient method would be to employ a trailer containing the batteries. Assuming the use of a trailer, the performance which would be obtained with batteries of various sizes propelling a bus of standard single-deck, 32-seater design, would be as follows:—(1) Battery cost (pre-war), £380 5s.; capacity, 96 Ah; weight, 2.12 tons; and distance per charge, 9-14.5 miles. (2) Battery cost £902 5s.; capacity, 288 Ah; weight, 5.65 tons; and distance per charge, 25-42 miles. (3) Battery cost, £1,424 5s.; capacity, 480 Ah; weight, 9.32 tons; and distance per charge, 35-56.5 miles. For the first distance-per-charge figure a consumption of 200 Wh per ton-mile and an average speed of 15 MPH are assumed, and for the second 150 Wh and 10 MPH.

Chemical Research Council

THE Council of the Chemical Society has formed an Advisory Research Council the main function of which will be, when approached, to bring to the notice of Fellows and others engaged in chemical research subjects for investigation likely to be of potential value to the nation at the present time. In the first instance such advice will be made available to unpaid research workers in universities, colleges, &c., and to research students in receipt of grants not definitely related to any particular concern.

Inquiries may be sent to Mr. S. E. Carr, secretary, the Chemical Society, Burlington House, Piccadilly, London, W.1.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

R. H. James, Ltd.—Private company. Registered October 17th. Capital, £500. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless and television sets, accessories and apparatus, artificial lighting apparatus, electrical fittings, &c. Permanent directors: R. H. James and Mrs. I. L. James, both of "Highlands," West Road, Bridgend, Glam.

Thomas A. Taggart, Ltd.—Private company. Registered in Dublin October 16th. Capital, £2,000. Objects: To enter into an agreement with the liquidator of Refrigerators, Ltd., for the purpose of taking over the business of the company, and to carry on the business of manufacturers of refrigerating plant, accessories, &c. Subscribers: Mrs. T. Taggart and T. A. Taggart, both of 10B, Seafield Road, Clontarf, Dublin.

Byray Electrical Supplies, Ltd.—Private company. Registered October 20th. Capital, £100. Objects: To carry on the business of dealers in and manufacturers and repairers of electrical goods of all kinds, including lamps, reflectors, bells, fires, stoves, &c. Directors: D. Weinboum and H. Weinboum, both of 24, Menelik Road, N.W.2. Registered office: 36, Mill Lane, N.W.3.

Companies' Returns

Statements of Capital

S. Dickinson, Ltd.—Capital, £1,000 in £1 shares. Return dated August 1st. 650 shares taken up. £5 paid. £645 considered as paid. Mortgages and charges, nil.

Portadyne Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated December 21st, 1938 (filed June 6th, 1939). All shares taken up. £500 paid. £500 considered as paid. Mortgages and charges, nil.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in 400 shares of £5. Return dated March 18th (filed July 26th), 1939. 250 shares taken up. £1,250 paid. Mortgages and charges, nil.

W. Sisson and Co., Ltd.—Capital, £50,000 in 38,000 ordinary, 5,000 preference and 7,000 deferred shares, all of £1. Return dated May 22nd. 31,711 ordinary, 4,375 preference and 7,000 deferred shares taken up. £28,686 paid on 24,311 ordinary and 4,375 preference shares. £14,400 considered as paid on the remainder. Mortgages and charges, nil.

Ashley Accessories, Ltd. — Capital, £7,500 in £1 shares. Return dated July 19th. All shares taken up. £2,500 paid. £5,000 considered as paid. Mortgages and charges, nil.

C. T. Briscoe & Son, Ltd.—Capital, £5,000 in £1 shares. Return dated July 1st. 2,750 shares taken up. £860 paid. £1,890 considered as paid. Mortgages and charges, £1,000.

Europe & Azores Telegraph Co., Ltd.—Capital, £200,000 in £10 shares. Return dated May 23rd. All shares taken up. £144,320 paid. £55,680 considered as paid. Mortgages and charges, nil.

Lisbon Electric Tramways, Ltd.—Capital, £1,500,000 in 1,000,000 ordinary and 500,000 preference shares of £1. Return dated June 21st. 949,755 ordinary and 425,553 preference shares taken up. £134,026 paid on 134,026 ordinary shares. £1,241,282 considered as paid on 815,729 ordinary and 425,553 preference shares. Mortgages and charges, £307,300.

La Plata Electric Tramways Co., Ltd.—Capital, £450,000 in 200,000 preference and 250,000 ordinary shares of £1. Return dated July 5. All shares taken up £170,007 paid on 170,007 preference shares. £279,993 considered as paid on 29,993 preference and 250,000 ordinary shares. Mortgages and charges, £78,300.

Mirrlees, Bickerton & Day, Ltd.—Capital, £600,000 in 100,000 5½ per cent. cumulative preference and 500,000 ordinary shares of £1. Return dated July 14th. 71,000 preference and 466,000 ordinary shares taken up. £302,500 paid on 71,000 preference and 231,500 ordinary shares. £234,500 considered as paid on 234,500 ordinary shares. Mortgages and charges, nil.

Parmeko, Ltd.—Capital, £15,000 in 5,000 preference and 10,000 ordinary shares of £1. Return dated July 25th. 4,500 preference and 8,500 ordinary shares taken up. £3,750 paid on 4,500 preference and 4,250 ordinary shares. £4,250 considered as paid on 4,250 ordinary shares. Mortgages and charges, £2,045 13s. 5d.

Shoreham and District Electric Lighting and Power Co., Ltd.—Capital, £20,000 in £1 shares. Return dated May 27th. 140,000 shares taken up. £133,500 paid. £6,500 considered as paid. Mortgages and charges, nil.

Bradford Electrical Services, Ltd.—Capital, £5,000 in £1 shares. Return dated July 19th. All shares issued and fully called up. Mortgages and charges nil.

Atlas Electric & General Trust, Ltd.—Capital, £6,500,000 in 3,000,000 preference, 3,000,000 ordinary and 500,000 unclassified shares of £1. Return dated July 20th. All preference and ordinary shares taken up. £1,749,078 paid on 1,214,189 preference and 534,889 ordinary shares, £4,250,922 considered as paid on 1,785,811 preference and 2,465,111 ordinary shares. Mortgages and charges: £750,000.

Concordia Electric Wire Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 25th. 57,319 shares taken up. £57,319 paid. Mortgages and charges: £4,000.

Kalgoorlie Electric Tramways, Ltd.—Capital, £250,000 in £1 shares. Return dated July 26th. All shares taken up. £250,000 paid. Mortgages and charges: £63,161 9s.

H. E. Keen & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated July 23rd. All shares taken up. £502 paid, £5,498 considered as paid. Mortgages and charges nil.

Bognor Regis Rediffusion Service, Ltd.—Capital, £10,000 in £1 shares. Return dated August 23rd. 7,500 shares taken up. £7,500 paid. Mortgages and charges, nil.

Rawlings Brothers, Ltd. — Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1. Return dated August 30th. 21,903 preference and 61,401 ordinary shares taken up. £83,304 paid. Mortgages and charges, nil.

T. B. T. Electric Co., Ltd.—Capital, £2,000 in £5 shares. Return dated August 30th. 200 shares taken up. £1,000 paid. Mortgages and charges, nil.

Electrical Power Engineering Co. (B'ham), Ltd.—Capital, £10,000 in £1 shares. Return dated October 2nd. 7,352 shares taken up. £3,100 paid. £4,252 considered as paid. Mortgages and charges, nil.

Alliance Electrical Co., Ltd.—Capital, £10,000 in £1 shares. Return dated February 16th (filed August 18th). 3,854 shares taken up. £1,927 (10s. per share) paid, £1,927 (10s. per share) considered as paid. Mortgages and charges nil.

Electrical & General Development Co., Ltd.—Capital, £20,000 in 2,000 shares of £10. Return dated August 14th. 600 shares taken up. £6,000 paid. Mortgages and charges nil.

Mortgages and Charges

Portsea Radio & Electrical Service, Ltd.—Mortgage debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated September 30th, 1939, to secure £200. Holder: B. Ereird, "Fleetwood," Edgware Road, N.W.2.

Wilec, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 22nd, 1939. to secure all moneys due or to become due from the company to chargee. Holder: M. Weinbaum, 327, Commercial Road, E.1.

Mayfair Shades, Ltd. — Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 22nd, 1939, to secure all moneys due or to become due from the company to the chargee. Holder: A. H. Wynborne, 90/96, City Road, E.C.

T. Clarke & Co., Ltd.—Satisfaction on December 3rd, 1937, of letter of deposit with deeds registered September 28th, 1934. Notice filed October 17th, 1939. (According to the register of mortgages, the only deed registered September 28th, 1934, was a mortgage which originally secured all moneys due to bank.)

Watson-Norie, Ltd.—Charge on 21, Lovaine Place, Newcastle-on-Tyne, dated September 29th, 1939, to secure £750. Holders: A. B. Thompson and M. G. Dobson, both of 12/14, Royal Arcade, Newcastle-on-Tyne.

Increase of Capital

Burgess Products Co., Ltd.—The nominal capital has been increased by the addition of £20,000, beyond the registered capital of £10,000. The additional capital is divided into 16,550 ordinary and 3,450 preference shares of £1 each, ranking *pari passu* with existing shares.

Companies to be Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved:—B. J. & N. Radio & Television Research Laboratories, Ltd.; Electric Ignition (Southend), Ltd.; Espensen Electric Supply Co., Ltd.; Loan-a-Radio (Croydon), Ltd.; Medical-Electro Therapeutics, Ltd.; Wireless Manufacturers & Trade Service (Western), Ltd.

Receivers Appointed

Electrical Commodities, Ltd.—David H. Allan, of 17, St. Helens Place, E.C.3, was appointed receiver and/or manager on October 10th, 1939, under powers contained in debenture dated May 30th, 1936.

William Maxwell & Co., Ltd.—Herbert Goodier, of 11, Argyll Street, W.1, was appointed receiver and manager on October 10th, 1939, under powers contained in debenture dated June 14th, 1933.

Sun-Lite Lamp Co., Ltd.—Arthur Canlett, of 5, Lower Temple Street, Birmingham, 2, was appointed receiver on October 11th, 1939, under powers contained in debentures dated March 17th, 1937. (The above is in substitution for the appointment made September 21st, 1939.)

Company Liquidations

Wetherill (Radio), Ltd., 15, Commercial Street, Harrogate, and 16, High Street, Wetherby, radio dealers, engineers, &c.—The statutory meeting of creditors was held on October 19th at the offices of Charles H. Baker & Co., York House, 3, Alfred Street, Boar Lane, Leeds. The statement of affairs disclosed liabilities of £445, and net assets of £141, leaving a deficiency of £303 so far as the creditors were concerned. The issued capital was £600, and as regarded the shareholders there was a deficiency of £903. The creditors passed a resolution confirming the voluntary liquidation of the company.

Warren Brothers (Middlesbrough), Ltd.—Winding up voluntarily. Liquidator, Mr. W. W. Sills, 3, Baker Street, Middlesbrough.

Gradley Electrical Co., Ltd.—Particulars of claims by November 14th to the liquidator, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2.

Leitner Electric Brake, Ltd.—Meetings November 29th at 209-11, Abbey House, Victoria Street, London, S.W.1, to receive an account of the winding up by the liquidator, Mr. J. J. Hawkins.

Pontypridd Wireless Service, Ltd.—Meeting November 14th at 35, Windsor

Place, Cardiff, to receive an account of the winding-up by the liquidator, Mr. L. S. Findlay.

Bankruptcy Proceedings

C. E. Ross and **T. E. Perks** (trading as Ross & Perks), electrical engineers, 166, Piccadilly, W.—This firm failed in February last and on October 17th the debtors applied at the London Bankruptcy Court for orders of discharge. The Official Receiver reported that the firm exploited an electrical self-registering dartboard in connection with which "R.P. & S. Patents, Ltd.," was formed. The debtors attributed their failure to loss sustained in connection with the company's shares. The joint liabilities amounted to £2,790 and the joint assets, which consisted chiefly of shares in the said company, although valued at £4,460, had proved unrealisable, and only £5 10s. had been received from the estate. The discharge in each case was suspended for two years.

C. Cakebread, maintenance electrician, 26, Garnault Road, Forty Hill, Enfield, Middlesex.—Receiving order made October 11th on debtor's own petition. Public examination November 28th at Charles Lamb Institute, Church Street, Lower Edmonton.

R. Bamforth, electrical engineer, 10, West Street, Hoyland, near Barnsley.—First and final dividend of 3½d. in the £, payable at 13, Burton Street, Wakefield.

W. E. Watson and **C. A. Childs** (Watson & Childs), wireless and electrical engineers, 7, City Road, and 5A, Southgate Street, Winchester, and at Salisbury, Fareham, Wickham, and Andover.—First and final dividend of 8d. in the £, payable November 6th, at 185-188, High Holborn, London, W.C.1.

A. Hitner, electrical engineer and radio dealer, 7, Linden Grove, Fallowfield, Manchester.—Discharge suspended for twelve months until September 25th, 1940.

D. Ll. Lewis, electrical products manufacturer, 332, Oxford Road, Manchester.—Discharge suspended for three months until December 25th, 1939.

P. W. Penty (Sackville Electrical Co.), electrical contractor, 38, Mannville Terrace, Morley Street, Bradford.—Supplemental dividend of 7d. in the £, payable on October 26th at 71, Manningham Lane, Bradford.

A. Elliott, electrical engineer, 14a, Hargreaves Street, and 148, Trafalgar Street, Burnley, and as Vacs Domestic Appliances at the Empress Hall, Butterworth Street, Littleborough.—First and final dividend of 3s. 7d. in the £, payable November 6th at 7, Lord Street West, Blackburn.

Reports and Dividends

Crabtree Electrical Industries, Ltd., reports that the net trading profit of the operating company, J. A. Crabtree & Co., for the year ended July 31st was £161,275, as compared with £160,149, and dividends totalling £85,000 will be paid to the holding company. The directors of the holding company propose to pay a final dividend of 5 per cent. and a cash bonus of 7½ per cent., less tax, on the ordinary shares. Both rates are unchanged. With the interim dividend the total distribution is again 17½ per cent., less tax.

Burco, Ltd., reports a net profit for the past year of £24,826, as compared with £33,453 in the preceding year. The final dividend is 10 per cent. (against 12½ per cent.), less tax, making 17½ per cent. for the year. In the previous year a bonus of 2½ per cent. was distributed, making the total for the year 22½ per cent.

Joseph Lucas, Ltd., report net profits for the year to August 7th of £352,430, an increase of £32,854 as compared with the preceding year. A special provision of £105,000 is made for obsolescence of stock in consequence of the war, reserve receives £50,000 and workpeople's funds are increased by £10,000. The final ordinary dividend is 12½ per cent., maintaining the distribution for the year at 15 per cent., and the balance carried forward is £16,878 lower at £63,703.

The Cawnpore Electric Supply Corporation, Ltd., has announced an interim dividend of 3 per cent. less tax (same).

The Shropshire, Worcestershire and Staffordshire Electric Power Co. is maintaining its interim dividends at 4 per cent. on the "A" shares and at 2½ per cent. on the "B" ordinary shares, less tax.

The St. Austell and District Electric Lighting and Power Co., Ltd., is paying an interim dividend of 4 per cent., less tax (against 5 per cent.).

The South Wales Electric Power Co. has declared an interim dividend of 2 per cent. less tax (unchanged).

The Wessex Electricity Co. has announced an interim dividend of 1½ per cent.

The Ever Ready Co. (Great Britain), Ltd., is maintaining its interim ordinary dividend at 15 per cent.

The Urban Electric Supply Co., Ltd., has declared an interim ordinary dividend of 4 per cent., less tax (same).

The Adelaide Electric Supply Co. is paying a final dividend of 5 per cent., making 10 per cent. (same), tax free, for the year to August 31st.

The Electrolux Corporation (of America) reports a net profit for the nine months ended September 30th of $1,113,000, as compared with $1,513,140 for the corresponding period of 1938. The net profit for the third quarter was $294,389 (against $301,435).

The Anglo-American Telegraph Co., Ltd., has announced an interim dividend for the quarter ended September 30th of 13s. per cent. on the ordinary shares (against 15s. per cent.), less tax at 7s.

The Telephone & General Trust, Ltd., is maintaining its interim dividend at 3 per cent., less tax at 6s. 3d. (against 4s. 9d.).

The River Plate Electricity and Other Securities Corporation has announced an interim dividend of 2½ per cent. (against 3 per cent.), less tax.

Germany's Electrical Markets

GERMANY'S exports of electrical goods declined during the first half of this year in comparison with those for the first six months of 1938 by 4,560,000 Rm. in value and 4,300 tons in weight, their total value having been 156,030,000 Rm. The following statement, extracted from the official foreign trade returns of the Reich, probably the last we shall receive for some time, shows the value in thousands of marks, weight in double centner (100 kg.) and in the case of lamps the number (in thousands) of electrical materials exported, together with the principal countries of destination of the more important groups of articles.

Outstanding customers for the smaller sizes of machines in the dynamo, motor, etc., group were Holland, the Scandinavian and Baltic countries, India, Belgium, Argentina and Brazil; for the medium sizes, Rumania, Brazil, Yugoslavia, Chile and Bulgaria; and for the larger sizes Brazil, Rumania, France, Finland, Egypt, South Africa and Afghanistan.

Notes of increases or decreases compared with 1938 have been added, but the comparison is only approximate because of the altered status of Austria and the Sudetenland and, in addition, there has been a change in the basis of compilation of the statistics.

	Jan.–June, 1939	Inc. or dec. on Jan.–June, 1938
Lighting and starting apparatus for motor vehicles, etc.—		
Value Rm. (1,000)	1,560	+ 245
Weight (double centner)	4,380	+ 1,430
Dynamos, motors, converters and transformers, up to 5 double centner—		
Value	9,200	+ 420
Weight	39,427	− 7,216
Dynamos, motors, converters and transformers, from 5 to 30 double centner—		
Value	3,390	− 127
Weight	21,183	− 2,780
Dynamos, motors, converters and transformers, over 30 double centner—		
Value	3,967	+ 34
Weight	26,090	− 9,210
Armatures and commutators—		
Value	1,790	+ 230
Weight	8,980	+ 490
Cable—		
Value	9,640	− 2,550
Weight	163,790	− 52,170
To Holland	1,135	− 605
,, Sweden	1,454	+ 64
,, Finland	789	+ 329
,, South Africa	320	− 180
,, Greece	465	+ 45
,, Rumania	786	− 454
,, India	309	− 51
Accumulators, plates, etc.—		
Value	2,522	+ 772
Weight	25,545	+ 6,325
To Holland	640	+ 280
,, Finland	107	+ 27
,, Argentina	170	—
,, Turkey	280	+ 235
,, Chile	290	+ 275
Electric irons—		
Value	360	+ 20
Heating and cooking apparatus—		
Value	4,830	+ 90
Galvanic batteries and parts and heating elements—		
Value	1,380	+ 130
Weight	12,780	+ 1,350
Measuring and recording instruments—		
Value	10,325	− 393
Weight	8,575	− 645
To Soviet Union	170	− 150
,, Belgium	410	− 100
,, Holland	930	− 90
,, Great Britain	860	+ 110
,, Sweden	1,190	+ 270
,, Argentina	235	+ 15
,, Italy	680	− 40
,, Turkey	190	+ 40
Metal filament lamps—		
Value	4,210	+ 290
Thousands	19,845	+ 3,515
To France	230	+ 10
,, Denmark	420	+ 110
,, Sweden	280	+ 70
,, Italy	315	+ 55
,, Chile	120	− 10
,, Turkey	130	+ 5
Telephone material—		
Value	9,580	− 575
Weight	6,766	− 176
To Finland	770	+ 180
,, Italy	1,300	− 230
,, Holland	1,940	− 300
,, Greece	810	− 60
,, Brazil	650	+ 440
,, Uruguay	520	+ 350
Radio material—		
Value	16,410	+ 1,390
Weight	18,165	+ 2,730
To Finland	650	+ 220
,, Yugoslavia	735	+ 65
,, Spain	620	+ 160
,, Holland	1,110	+ 130
,, Sweden	1,430	+ 770
,, Turkey	610	+ 270
,, Hungary	1,150	+ 940
To Brazil	570	− 360
,, Japan	990	− 520
Safety and signalling apparatus—		
Value	2,870	+ 900
Weight	3,800	+ 130
To Argentina	240	+ 120
,, Holland	680	+ 290
,, Japan	445	+ 445
Ignition apparatus, etc., and parts (excl. magnetos) and elec. accessories for motor vehicles—		
Value	6,840	− 10
Weight	9,290	+ 375
To France	410	− 70
,, Sweden	1,130	+ 350
,, Italy	550	− 210
,, Great Britain	510	− 270
,, Hungary	520	+ 250
Apparatus for lighting, power transmission, electrolysis, resistances, etc.—		
Value	33,480	− 380
Weight	110,780	− 6,430
To Belgium	1,010	− 830
,, India	900	+ 90
,, Italy	1,380	+ 10
,, Holland	3,380	− 120
,, Sweden	4,160	+ 400
,, Argentina	1,070	− 410
,, Great Britain	985	− 325
,, Finland	1,680	+ 170
,, Yugoslavia	1,000	+ 40
Telegraph or telephone insulators—		
Value	1,415	+ 365
Weight	24,630	+ 6,850
Electro-medical and dental apparatus—		
Value	6,620	− 440
Conduit tubes of paper or cardboard—		
Value	650	+ 30
Weight	13,380	+ 680

STOCKS AND SHARES

Tuesday Evening.

STOCK Exchange markets have made further strides towards throwing off the effects of war-time conditions. Business is on the increase. The number of bargains done daily is at least twice as many as that of six weeks ago. Substantial rises in War Loan and British Government stocks have set a good example to other markets. These rises have also had the effect of releasing money that has found employment in other parts of the House.

Company reports and dividends are, on the whole, satisfactory, though an occasional jolt is administered through the necessity of providing against the increased taxation. Ever Ready declares its usual 15 per cent. interim dividend and the Urban Electric Supply Company's 4 per cent. is the same as a year ago. Amongst the final dividends, that of the Adelaide Electric Supply again makes 10 per cent. tax free.

Gilt-edged Strength

The influence exerted by the gilt-edged market on other sections of the Stock Exchange has continued cheerful. The majority of gilt-edged stocks have drawn well clear of the minimum quotations on which they were grounded for the first six weeks or so of the war. War Loan, one of the last stocks to break free, and unsaleable for weeks at 88½, is now in demand at nearly 93. Concurrently, the yield has dropped from about 4 per cent. to £3 17s. per cent. Conditions are greatly improved for the launching of the Government borrowing programme, and there is a tendency to revise views among people who were pessimistic over the chances of the Treasury being able to carry out the programme at reasonably low rates of interest.

The measure of success achieved in this respect by the Treasury will be, of course, a material factor in the cost of the war. From the market point of view, it will carry much weight in assessing the yields to be expected from ordinary shares. Among the laggards in the gilt-edged market are the Central Electricity Board issues, which remain on the minimum prices. London Transport "A" and "B" stocks, however, are each a point clear of the minima, while the London Electric Transport 2¾ per cent. guaranteed stock has risen to 84.

Electricity Supply Shares

With welcome assistance from the decision to relax the restrictions on domestic use of electricity, the market in electricity supply shares has consolidated the recent advance of prices. Buoyancy in gilt-edged stocks, with which this market generally keeps in close touch, has also been an influence for good; while the September increase in the output of the Edmundson's group continues as an encouraging factor. The price of Edmundson's shares, having been well to the front in the improvement, is 1s. up, at 22s. Otherwise there are few changes, although the predilection for north country undertakings is evident in the gains of 2s. in Clyde Valleys, at 33s. 3d., and of ⅛ in Scottish Power, at 32s. 6d. In the overseas group, the revival of Tokyo Electric "sixes," to 45½, is noticeable. This movement is in keeping with a generally more hopeful view of Japanese securities. Victoria Falls, at 68s. 9d., have held the previous week's spurt of 5s.

Equipment and Manufacturing

After a fortnight of pronounced recovery, the tendency among electrical equipment shares is to move still higher. In particular, the group of cable manufacturing shares is strong. Callender's, at 57s. 6d., have risen half a crown following upon a similar gain last week. Enfields have strengthened from 42s. 6d. to 43s. 9d., and Henleys from 16s. 3d. to 17s. 6d. Crompton Parkinsons are being bought at around 17s. 6d. Ever Ready, with another rise to 25s., have the uncommon distinction of being at the highest price of the year. Associated Electricals are 1s. 9d. higher at 37s. 6d. Elsewhere, Tube Investments have advanced 3s. 9d. to 4⅛; Vickers are up to 17s. 6d.

J. Lucas Results

News of the J. Lucas profits for the year ended in August gave the market an agreeable surprise. This found practical expression in an immediate rise of 4s. 6d. in the price of the shares. They are now changing hands at around 49s. ex dividend. The company's profits statement indicates that little difficulty was experienced in maintaining the dividend at 15 per cent., despite the necessity for special financial provisions arising out of the war. Thus net profits are above last year's, yet provision for taxation must inevitably have entailed a much larger allocation. The company sets aside a special obsolescence reserve of £105,000, adds £50,000 to the ordinary reserves, and £10,000 to the workpeople's funds.

Crabtree Electrical

Another report which made pleasant reading was that of Crabtree Electrical Industries, whose 10s. ordinary shares strengthened from 17s. 6d. to 19s. 6d. ex dividend on the repetition of the dividend at 17½ per cent., accompanied by satisfactory figures of earnings. Revenue of this company comes in the shape of dividends from the operating subsidiary, J. A. Crabtree & Co., which reports a net trading profit of £161,275, against last year's figure of £169,150. Out of the former, the sum of £85,000 has been paid in dividends to the parent company. It may be remembered that the issue of the ordinary capital created a considerable stir when the shares were offered, three years ago, at 12s. 9d. per share. A substantial premium over the prospectus price developed immediately, and the shares went ahead by leaps and bounds until a halt was called at well over 30s.

Preference Shares

Four-and-a-half to five per cent. is the range of yields on first-class preference shares in the same market. The lower of those two rates is the return on the 4½ per cent. preference shares of London Associated Electric and Lincolnshire and Central Electric. The yield is about 4¾ per cent. on the 6 per cent. shares of Midland Counties and Northmet Power, at 25s. On British Power and Light sixes, at 24s. 6d., and City of London eights, at 34s., the return works out at 4.9 per cent. Among the higher yields are Lancashire Electric 7 per cent., at 28s. 6d., paying 5¼ per cent. on the money, and Welwyn Garden City sevens, which are offered at 24s. to yield 5.8 per cent. As always, the disposition is to accept lower yields from the shares quoted near their par values. These, it is argued, run less risk of capital depreciation.

Fixed Interest Securities

In keeping with the turn of events in the gilt-edged markets, the revival of interested inquiry for well-secured preference and debenture investments has continued. People who picked up such of these stocks as were being jettisoned, only a week or two ago, for what they would fetch, have made some good bargains. As in the gilt-edged market, events seem to have caused a change in the heart of former would-be sellers, who are evidently discovering fresh merit in the assurance of a steady and reliable income. As mentioned here in a recent note, the average yield on electricity supply company debenture stocks is somewhere about 4 per cent., or even less where there is the prospect of a profit on redemption over a limited number of years. On the new North Metropolitan Power 3¼ per cent. stock, for instance, at 87, the yield is £4 0s. 3d. per cent., or £4 6s. 9d. per cent. allowing for the profit on redemption in 1965.

Miscellaneous Matters

While Cable and Wireless stocks have a firm appearance, weakness has developed in the £10 shares of Great Northern Telegraph, now quoted rather nominally at 25½ after a fall of £2 10s. This may be connected with the understanding that much of the company's traffic with the Far East travels over land lines through Russia. The last balance sheet showed an impressive financial position, with investments and other assets at a figure giving the shares a break-up value in the neighbourhood of the present quotation. American "Tel. & Tel.," quoted at 203 middle, are at the highest price of the year. Canadian Marconis are 1s. up, at 6s.; Marconi Marines have gone back to 25s. Home Railway stocks reflect the confident expectation that, when announced, the terms on which the Government has assumed control will prove reasonably generous. Southern 5 per cent., preferred is 3 points up, at 61, which compares with 48 a few weeks ago. British Electric Traction, at 713, has followed up a rise of 100 with another of 75. Tillings have gained ⅛ at 35s. Tilling and British Automobile at 45s. are equally better.

America and the War

IN a recent issue the *Electrical World* (New York) in an endeavour to indicate the possible effects of the war upon the electrical industries of the United States, surveyed the course of events in 1914-18. In 1914 the electrical manufacturing industry was just emerging from a period of depression and it was thought that the war in Europe would lead to a boom in exports. But, says our contemporary, the high hopes of profit in export trade did not materialise. The dollar values of exported electrical goods were actually less in 1914 and 1915 than in 1913. When the value did eventually rise it was probably due more to increased prices than to greater volume. American manufacturers were too occupied in producing munitions of war for the belligerents to be able to expand electrical trade, but they benefited in the home market from the consequent demand for industrial power.

The electrical utilities began to show remarkable expansion and difficulty was encountered in meeting their demands for equipment. The principal handicap however was the coal shortage which they experienced on account of the transport situation and measures had to be taken to reduce consumption. Some of these measures, applied to industrial establishments, were effective but others were not. "Lightless nights" (*i.e.*, extinguishing of street lighting and signs) were ordered and people were asked to cut down lighting in their homes. It was shown at the time that the energy used for domestic lighting was equivalent to only about 0.5 per cent. of the country's total coal consumption and at the most regulation of domestic lighting could reduce the national coal consumption by only 0.1 or 0.2 per cent.

The demands of labour led to unrest and higher costs, but even more serious was the difficulty experienced by utilities in raising funds for essential needs. Eventually Government intervention became necessary.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Oct. 24	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	57/–	15	15	57/6		5 4 4
British Power and Light	30/9	21/–	7	7	24/–	+6d.	5 16 8
City of London	33/9	23/6	7½	7½	23/6		6 7 8
Clyde Valley	37/9	27/6	8	8	33/3	+2/–	4 19 3
County of London	46/9	28/–	10½	10½	35/–	+¼	6 0 0
Edmundson's:							
7% Pref.	31/6	27/6	7	7	28/–	+6d.	5 0 0
Ord.	27/9	18/6	9	6	22/–	+1/–	5 9 1
Elec. Dis. Yorkshire	41/6	32/6	9	9	35/–	—	5 2 5
Elec. Fin. and Securities	47/9	40/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	51/9	41/–	12	12	41/3	—	5 16 0
Isle of Thanet	20/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	34/6	25/–	7½	7½	27/6	+¼	5 9 1
Llanelly Elec.	22/6	17/6	5½	5½	18/–	—	6 2 3
Lond. Assoc. Electric	30/–	18/9	7	7	18/9	—	7 9 4
London Electric	34/3	22/6	7	7	23/9	—	5 18 0
London Power Deb. Red.	106½	98	5	5	101½	—	4 18 6
Metropolitan	51/–	35/–	12	12	35/–	—	6 17 2
Midland Counties	38/9	30/–	8	8	34/–	+¼	4 14 3
Mid. Elec. Power	41/9	35/–	8	9	35/–	—	5 2 10
Newcastle Elec.	28/9	26/–	7	7	26/3	—	5 6 8
North Eastern Electric:							
Ordinary	32/3	23/6	7	7	27/–	+1/6	5 3 10
7% Pref.	32/6	27/6	7	7	28/–	+6d.	5 0 0
Northampton	48/–	41/–	10	10	41/3	—	4 17 0
Notting Hill 6% Pref. (£10)	12½	11½	6	6	11½	—	5 4 4
Northmet Power:							
Ordinary	46/6	30/6	10	10	35/9	—	5 14 3
6% Pref.	29/–	23/6	6	6	24/6	—	4 18 0
Richmond Elec.	29/–	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	28/6	8	8	32/6	+1/3	4 18 6
Southern Areas	22/9	17/–	5	5	17/–	—	5 17 6
South London	30/9	23/9	7	7	23/9	—	5 18 0
West Devon	23/3	18/9	5	5	18/9	—	5 6 8
West Glos.	21/3	16/3	2	2½	16/3	—	3 1 6
Yorkshire Elec.	38/6	28/9	8	8	33/3	—	4 16 3
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	1/6	—	—
Calcutta Elec.	39/–	25/–	10*	10*	30/–	+1/6	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	—
East African Power	26/3	20/–	7	7	20/–	—	7 0 0
Jerusalem Elec.	24/6	21/–	7	7	22/–	+1/–	6 7 3
Kalgoorlie (10/–)	10/6	9/–	7½	7	10/–	+1/–	7 0 0
Madras	31/–	21/3	8*	8*	21/3	—	—
Montreal Power	35½	30	1½	1½	32	—	—
Palestine Elec. "A"	29/6	20/–	7½*	5*	20/9	+9d.	4 16 5
Perak Hydro-electric	18/9	13/6	7	6	18/9	—	7 6 8
Shawinigan Power	24	20	85cts.	83cts.	23½	—	—
Tokyo Elec. 6%	61	37	6	6	45½	+3	13 3 8
Victoria Falls Power	73/9	60/–	12½	15	68/9	—	4 7 3
Whitehall Investments Pref.	19/6	12/6	7½	7½	12/6	—	12 0 0
Public Boards							
Central Electricity:							
1950–70	112	103	5	5	103	—	4 17 1
1955–75	115½	104½	5	5	104½	—	4 15 8
1951–73	106½	101	4	1½	101	—	4 9 0
1963–93	95½	84	3½	3½	84	—	4 3 4
London Elec. Trans. Gtd.	88½	83	2½	2½	84	+1	2 19 6
London & Home Counties							
1955–75	107½	105	4½	4½	105½	—	4 5 6
Lond. Passenger Transport:							
A	114½	103	4½	4½	104	+1	4 6 5
B	117½	102	5	5	103	+1	4 17 0
C	83½	64½	4	1½	65	—	2 6 2
West Midland Joint Elec., 1948–68	112½	104½	5	5	104½	—	4 15 8
Telegraph and Telephone							
American Tel. & Tel.	204	159	9	9	203	+3	4 8 8
Anglo-Am. Tel.:							
Pref.	101½	82	6	6	85½	—	7 0 4
Def.	23⅝	18½	1½	1½	18½	—	8 2 2
Anglo-Portuguese	24/–	17/6	8	8	17/6	—	9 2 10
Cable & Wireless:							
5½% Pref.	95½	75	4½	5½	83	+1	6 11 9
Ord.	55	34	4	4	49½	—	8 2 0
Income	100	87½	—	—	88½	+1	4 10 5
Canadian Marconi $1	6/–	3/9	—	Nil	6/–	+1/–	—
Globe Tel. & Tel.:							
Ord.	31/3	23/6	7½*	7½*	26/3	—	6 0 0
Pref.	26/9	22/6	6	6	22/6	—	5 6 8
Great Northern Tel. (£10)	38	27½	20	20	25½	−2½	7 17 10
Inter. Tel. & Tel.	10½	5½	Nil	Nil	6½	—	—
Marconi-Marine	30/–	23/–	7½	10	25/–	−¼	8 0 0
Oriental Telephone Ord.	2½	46/3	12*	12*	2 5/8xd.	−2/–	5 4 0
Radio Corpn.	8½	5½	8	6	7	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	7/–	10	10	7/–	—	7 2 10
Western Union	40½	19½	2½	—	40	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	3/9	—	—
4% Inc.	16	5	Nil	Nil	5½	—	—
British Electric Traction:							
Def. Ord.	1025	515	5	5	713	+75	—
Pref. Ord.	164	130	8	8	140	—	5 6 3
Bristol Trams	52/6	36/3	8	10	39/6	+¼	5 11 4
Brazil Traction	13	7½	$1	50c.	0⅝	+1	—
Calcutta Trams	25/6	20/9	8	8	20/9	—	7 14 3
Cape Elec. Trams	18/–	16/9	5	6	17/–	—	7 1 2
Lancs Transport	37/9	27/6	10	10	30/–	+5/–	6 13 4
Mexican Light:							
1st Bonds	25	20	5	5	20	—	—
Rio 5% Bonds	81	47	5	5	55	—	8 9 2
Southern Rly.:							
5% Prefd.	75½	48	5	5	61	+3	8 4 4
5% Pref.	99½	79	5	5	81	+1	6 3 5
T. Tilling	2½	32/6	10	10	35/–	+¼	5 14 3
Tilling & B.A.	54/6	43/9	10	9*	45/–	+¼	4 2 3
West Riding	37/9	30/–	10	10	30/–	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	25/–	15	15	25/–	−½	12 0 0
Assoc. Elec.:							
Ord.	45/3	31/3	10	10	37/6	+1/9	5 6 8
Pref.	36/6	31/3	8	8	33/9	+½	4 14 10
Automatic Telephone & El.	47/6	39/3	10	12½	40/–	—	6 5 0
Babcock & Wilcox	48/–	37/–	10	12½	42/6	—	5 17 8
British Aluminium Ord.	58/9	48/9	12½	12½	55/–	—	4 11 0
British Insulated Ord.	88/–	72/6	20	20	72/6	—	5 10 3
British Thermostat (5/–)	16/–	12/–	18½	18½	13/3	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	12/6	40	40	12/6	—	—
Brush Ord.	5/9	4/–	Nil	Nil	4/–	—	—
Callender's	92/–	52/6	20	15	57/6	+½	5 4 1
Chloride Elec. Storage	82/3	62/6	20	15	3½	—	4 12 4
Consolidated Signal	96/–	75/–	36½	36½	75/–	—	9 14 8
Crabtree (10/–)	25/6	17/6	17½	17½	19/6xd.	+3/–	8 19 6
Crompton Parkinson:							
Ord. (5/–)	21/–	12/6	12½	15	15/–	—	—
E. K. Cole (5/–)	9/–	3/–	10	Nil	4/6	+6d.	—
Elec. & Musical Industries (10/–)	14/9	7/–	5	Nil	7/6	−3d.	6 13 4
Electric Construction	38/6	25/–	12½	13½	25/–	—	10 16 0
Enfield Cable Ord.	58/6	42/6	25	16½	43/9	+¼	7 8 5
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/6	25/–	10	10	31/3	+¼	6 8 0
Ensign Lamps (5/–)	16/9	13/9	—	25	15/9	—	7 18 3
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	35/–	—	3 11 5
Ever Ready (5/–)	25/–	18/–	35	30	25/–	+6d.	6 0 0
Falk Stadelmann	27/–	17/6	10	6	17/6	—	6 17 2
Ferranti Pref.	25/6	22/–	7	7	22/–	—	6 7 3
G.E.C.:							
Pref.	31/9	26/3	6½	6½	26/3	—	4 19 2
Ord.	82/–	61/3	17½	20	72/6	—	5 10 4
Greenwood & Batley	27/6	22/6	7	15	22/6	—	13 6 8
Hall Telephone (10/–)	22/3	19/3	15	15	17/6	—	8 11 6
Henley's (5/–)	21/–	15/–	20	20	17/6	+¼	5 14 3
4½% Pref.	23/–	18/9	4½	4½	18/9	—	4 16 10
Hopkinsons	46/3	37/3	12½	15	37/6	—	8 0 0
India-Rubber Pref.	21/3	18/9	5½	5½	18/9	—	5 17 4
Intl. Combustion	120/–	97/–	32½	32½	5	—	6 10 0
J. Lucas	60/–	45/–	15	15	49/–xd	+4/6	6 3 0
Johnson & Phillips	41/3	32/–	12½	12½	35/–	—	7 2 10
Lancashire Dynamo	72/–	55/–	25	25	55/–	—	9 1 10
Laurence Scott (5/–)	12/–	9/6	15	15	9/6	—	7 18 4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	39/–	13½	13½	42/6	+1/3	6 7 8
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	77/6	—	5 3 9
Pye Deferred (5/–)	13/9	7/6	25	25	7/6	—	16 13 4
Revo (10/–)	35/6	25/–	17½	17½	25/–	—	7 0 0
Reyrolle	61/–	52/6	12½	12½	52/6	—	4 15 3
Siemens Ord.	26/9	18/9	7½	7½	18/9	—	8 0 0
Strand Elec. (5/–)	5/6	3/3	10	4	3/3	—	6 3 1
S. Smith (1/–)	9/–	6/–	37½	50	6/3	—	8 0 0
Switchgear & Cowans (5/–)	15/–	10/–	20	20	10/–	—	10 0 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	32/6	10	10	32/6	−½	6 3 1
Telephone Mfg. (5/–)	10/–	7/–	9	9	7/–	—	6 8 7
Tube Investments	91/–	72/6	23½	23½	81/3	+¼	5 18 3
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	14/6	10	10	17/6	+6d.	5 14 3
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	36/–	17½	17½	32/6	+⅛	8 15 0
Walsall Conduits (4/–)	31/9	21/3	55	55	23/9	—	9 5 2
West, Allen (5/–)	7/6	5/9	7½	10	5/9	—	8 14 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Australia. — BRISBANE.—City Council. November 8th. Four 500-kVA transformers. (T. 27252/39.)*

INGHAM (QUEENSLAND). — November 29th. Hinchinbrook Shire Council. Crude oil engine and alternator. (T. 27418/19.)*

Birkenhead.—November 14th. Electricity Department. Cables and meters. (See this issue.)

Birmingham.—December 8th. Electric Supply Department. High - pressure steam pipework and associated valves and drain pipework for four new boilers and two new turbo-alternators at the Hams Hall "B" power station. (October 20th.)

India. — November 8th. Bombay, Baroda and Central India Railway Co. Gas-filled and vacuum tungsten filament lamps. N. Lincoln, secretary, Guildcroft, Epsom Road, Guildford, Surrey.

Ipswich.—November 21st. Corporation. Steel-frame buildings for boiler and turbine house, and a 110-ton and other electric overhead travelling cranes at the new Cliff Quay power station. (October 6th.)

Llandudno. — November 4th. U.D.C. Four electrically driven centrifugal pumps and automatic control equipment for delivering water to two storage reservoirs on the Great Orme. Engineer's Office, Town Hall (deposit £1).

London. — BATTERSEA. — October 31st. Electricity Department. One 30,000-kW turbo-alternator and ancillary plant, and two 180,000 lb. boilers and ancillary plant. (September 29th.)

New Zealand.—WELLINGTON.—November 14th. Supply of 50-kV, three-phase, outdoor switchgear and steelwork complete with insulators and accessories. (T. 26179/39.)*

November 21st. Public Works Department. Protective relays for 110-kVA transmission lines. (T. 26821/39.)*

December 5th. Fifty 5-kVA transformers. (T. 27809/39.)*

November 14th. Eighteen outdoor pole-mounted line-type lightning arrestors. (T. 27807/39.)*

December 5th. 50-kV outdoor switchgear and steelwork for Hangatiki substation and 110-kV outdoor switchgear and steelwork for Ongarue sub-station. (T. 27495/39.) Four 10,000-kVA transformer units. (T. 27496/39.)*

November 28th. Two 1.500-kVA transformer banks. (T. 27493/39.)*

November 14th. Twenty-four 110-kV single-phase potential transformers. (T. 27492/39.)*

November 24th. Post and Telegraph Department. Engine-generator set. (T. 27490/39.)*

Plymouth.—November 15th. Electricity Supply Department. Ash disposal plant and auxiliary apparatus. (October 13th.)

Sheffield.—November 7th. Electricity Committee. Auxiliary 11-kV three-phase, 150-MVA switchgear. (October 6th.)

South Africa. — JOHANNESBURG. — November 17th. City Council. 33-kV switchgear and auxiliary plant. (T. 25663/39.)*

November 20th. Railways and Harbours Administration. Superheater elements. (T. 26975/39.)*

November 6th. Electric lamps. (T. 27777/39.)*

CAPE TOWN.—November 15th. Electricity Department. Two mercury arc rectifier equipments. (T. 27601/39.)*

January 15th. Booster pumps, complete with driving motors, &c., and piping, two sets of motor starting and control gear, two 3.300-V iron-clad switchboards, two 380/220 V iron-clad distributor boards and one overhead travelling crane. (T. 27966/39.)*

Southport.—November 6th. Corporation. E.h.v. switchgear. (October 20th.)

Uruguay. — MONTEVIDEO. — November 10th. State Electricity Supply and Telephones Administration. 300,000 metres of telephone cable. (T. 26933/39.)*

Orders Placed

Bradford.—Electricity Committee. Accepted. Turbine driven boiler feed pump and circulating water pump for Valley power station.—Mather & Platt, Ltd. Fire fighting equipment for Sundridge Road sub-station.—Foamite, Ltd.

Brighton. — Corporation. Accepted. Boiler feed pump for Southwick power station.—Mather & Platt. High-voltage switchgear for the Ridgeway (South) substation and also for Hollingbury Road sub-station.—Switchgear & Cowans.

Eccles.—Electricity Committee. Accepted. Sub-station switchgear in connection with the electrification of machinery at Barton swing bridge and locks.—Metropolitan-Vickers Electrical Co., Ltd.

London. — SOUTHWARK. — Electricity Committee. Accepted. Cooling tower repairs (£250).—Davenport Engineering Co.

Manchester. — Electricity Committee. Accepted. Automatic protection of 33,000-V bus-bars at Barton power station.—British Thomson-Houston Co. 30-kW mercury arc rectifier.—Electric Construction Co. Extension of private automatic telephone system.—Standard Telephones & Cables.

Education Committee. Accepted. Lightning protection work at College of Technology extension.—J. Faulkner & Sons.

Middlesbrough.—Town Council. Accepted. Transformers.—Electric Construction Co.

Newcastle-on-Tyne.—City Council. Accepted. Electrical installation at the new Waterworks Road junior school (£226).—R. W. Leek and Co.

Stoke-on-Trent.—Assistance Committee. Accepted. Automatic protection of 33,000-moor institution annexe (£57).—E. Holloway, Ltd.

Tiverton.—Town Council. Accepted. Pumps and electrical equipment at Bolham (£732).—J. Evans & Sons.

Wallasey.—Electricity Committee. Recommended. Reconditioning ash conveyor (£696).—Bennis Combustion, Ltd. Switchgear modifications at power station and four sub-stations (£23,201).—Metropolitan-Vickers Electrical Co., Ltd.

West Hartlepool.—Town Council. Accepted. Electrical installation in a new garage for the Transport Department.—John Pounder.

Worthing.—Town Council. Accepted. Electrical installation at West Tarring Senior School (£1,055).—H. J. Galliers.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Laundry at general hospital; secretary.

Aberdeen.—Reconstruction and extention of high school for girls (£40,000); city architect.

Ashby-de-la-Zouch. — Cinema, Market Street; H. S. Scott, architect, 115, Colmore Row, Birmingham.

Birkenhead. — Estate development, off Gayton Lane; Glegg Estate Development Co.

Birmingham. — Pasteurising dairy, King's Norton, for Ten Acres and Stirchley Co-operative Society, Ltd., Umberslade Road, Stirchley; H. W. Simister, architect, Norwich Union Chambers.

Boston.—Adaptation of old church, Willington Road, Kirton, as fire station; R.D.C. surveyor.

Cambridgeshire.—Alterations to technical and girls' secondary schools, for C.C.; county architect, Cambridge.

Chelmsford.—Estate development, near Chignall Road; Melbourne Park Estate Co.

Cheshire.—School at Hoole and child welfare centre, Runcorn; county architect.

Chester.—Flats, Linenhall Street; T. Keith Hill. Health centre, Lache Estate; borough surveyor.

Colchester.—Maternity home extensions (£6,547); H. Everett & Son, contractors.

Croydon.—Extensions to Mayday hospital (£15,616); borough engineer.

Cumberland.—New schools for the E.C. at Aspatria, Wigton, Brampton, Millom and Penrith; county architect, 4, Alfred Street North, Carlisle.

Darlington.—Factory for the Thecla Engineering Co., Ltd.; A. C. Lynch, architect, 45, Cleveland Avenue, Darlington. Garage, Haughton Road, for the Haughton Car Co.; J. E. Chilton, architect, Tubwell Row, Darlington.

Douglas (I. of M.).—Additions and alterations to St. Mary's Catholic School, Hill Street (£5,325); Rev. T. Turner.

Dovercourt. — Houses (36), Ashley Road; C. E. Eves.

Dunston-on-Tyne.—Offices at the Team Glass Works for G. Davidson and Co., Ltd.; Arthur and Kirkup, architects, 13, Swinburne Street, Gateshead.

Durham.—Alterations to Palmers Hospital, Jarrow; W. J. Merrett, county surveyor, Shire Hall, Durham City.

Eastbourne.—Alterations and additions to premises in Tideswell Road; Langney Motors, Ltd.

Eccles. — Works extensions, Hardy Street; L. Gardner & Sons, Ltd.

Essex.—Extensions to Suttons Institution (£17,621), for C.C.; county architect, Chelmsford.

Gateshead.—Factory, Second Avenue, for the Danish Bacon Co., Ltd.; Cackett, Burns Dick and McKellar, architects, 21, Ellison Place, Newcastle-on-Tyne. Alterations to premises at Bensham, for the Ravensworth Garage Co., Ltd.; Stephenson & Gillis, architects, 2, Saville Place, Newcastle-on-Tyne. Theatre, Saltwell Road; Hill & Honeyman, architects, 6, Eldon Square, Newcastle-on-Tyne. New premises at Queensway on the Team Valley estate for St. Mary's Motors, Ltd.; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne. Houses on the South Saltwell Estate, for F. Bowman; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne. Flats, Duncan Street, for R. Finn, Winchester Street, South Shields.

Gloucestershire.—Extensions to Chipping Campden Grammar School.

Great Yarmouth.—Extensions to Yarmouth Hospital; secretary.

Herefordshire.—Completion of reconstruction of County Assistance Hospital, Hereford, and adaptation of P.A.C. Institution for sick patients, for C.C.; county architect.

Horbury.—Extensions to works, for C. Roberts & Co., Ltd., Horbury Junction.

Hucknall (NOTTS).—Fire station, Gilbert Street; U.D.C. surveyor, Council Offices, Watnall Road, Hucknall.

Jarrow (CO. DURHAM).—Conversion of post office into a report centre; J. Scott Weir, borough engineer, Town Hall, Jarrow. Extensions to Primrose Hospital; borough engineer.

Kingswood (SURREY).—Shops and flats, Brighton Road, for J. Fisher; A. V. Stubbs, architect, The Crossways, Heston, Middlesex.

Kirkham (LANCS).—Hospital, Wesham; J. T. Gabbott, contractors, Thorne Street, Preston.

Leven.—Premises in South Street for McDonald & Sons.

Lincoln.—County Hospital extensions (£35,000); secretary.

Liverpool.—Elementary school, Blackstock Street; city engineer. Flats, Cleveland Street and Byles Street, for Housing Committee; L. H. Keay, housing architect.

London. — (PECKHAM). — Soap works, Copeland Road; London Oil Refining Co., Gundulf Street, S.E.11.

Longhirst (NORTHUMBERLAND).—Alterations to Longhirst Hall; Elliot Bros., contractors, Otterburn Terrace, Jesmond, Newcastle-on-Tyne.

Manchester.—Shops, Panfield Street; H. J. Holgate & Co. Fire station, Wythenshawe (£41,555); C. Musker & Bros., Ltd. Additions to factory, Vesta Street, Mill Street, Ancoats, for C. Whatnough, Ltd.; David Walton & Co., Ltd., contractors, Clarendon Road, Pendleton, Manchester, 5.

Melton Mowbray.—Large assembly hall and classrooms; Rev. H. R. Bates, vicar, St. Mary's Parish Church, Burton Street.

Nantwich.—Houses at Audlam, Newham, Minshull Vernon, &c.; H. Crabtree, R.D.C. engineer and surveyor.

Newcastle - under - Lyme. — Cinema, Bridge Street; R. Satchwell, architect, 6, New Street, Birmingham.

Newcastle-on-Tyne.—Alterations to the Locomotive Inn, St. Lawrence Road, for Ridley Cutter and Firth; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle. Twenty houses, Bourne Avenue; Palmer and Wilson, builders, Fowberry Crescent, Newcastle. Customs office near the Ouseburn for the City Council; F. P. Dodsworth, builder, Hill Heads, Whitley Bay. Shelter, Millburn House; J. R. Rutherford and Sons, contractors, Minories Joinery Works, Jesmond. Shelter, Grainger Street; J. N. Fatkin, architect, 17, Bigg Market, Newcastle. Shelter, Haymarket; Kirk & Dickinson, contractors, 182, New Bridge Street, Newcastle. Shelters, Byker depot; Davison, Eason & Harkness, contractors, New Mills, Barrack Road, Newcastle.

Ormskirk (LANCS). — Extensions to general hospital; Henry Taylor, contractor, 32, Burscough Street, Ormskirk.

Penrith.—Erection of huts for the Penrith and Keswick Hospital Board (£1,400).

Redditch.—Extensions to factory for J. H. Yeoman & Sons, Ltd., Evesham Road, Astwood Bank.

Sedgefield (CO. DURHAM).—Shelters for R.D.C.; J. Tarren, Council Offices.

Stockton-on-Tees.—R.C. school for girls and additions to St. Bede's boys' school; A. Harrison, architect, 69, High Street, Stockton-on-Tees.

Stoke-on-Trent. — Licensed premises, Milton Road, Sneyd Green; Forshaw & Greaves, architects. Houses (30), Willow Grove, Blurton; F. C. Gibson. Houses (22), Central Drive, Blurton; Higginson & Cope.

Stratford-on-Avon.—Hospital buildings at Public Assistance Institution; S. F. Swift & Sons, contractors, 200, Alcester Street, Birmingham, 12.

Stroud.—Extensions to Stroud Laundry, Ebley.

Sunderland.—Extensions to municipal hospital. Fire station, Fulwell, for the T.C.; Bell Brothers, builders, Sunderland. Shelters, for Corporation; Hudson & Sons, Ltd., St. Marks Crescent; Huntley & Sons, Marion Street; D. & J. Ranken, Ltd., Stockton Road; and Randle & Co., Ltd., Back Dunelm Street.

Tyneside.—Relay stations, for Northern Rediffusion Service, Ltd., 79, Blackett Street, Newcastle-on-Tyne.

Tynemouth.—Chapel, Alnwick Avenue; Church of Christ trustees.

Uttoxeter.—Houses for agricultural workers; R.D.C. surveyor.

Warwickshire.—Junior school, Hatchford Crescent, and senior school, Lyndon Road, Solihull, and senior school, Southam; A. C. Bunch, county architect, Shire Hall, Warwick.

West Sussex.—Additions to senior school at Shoreham; girls' senior school at Southwick; new elementary school, Bounstone Lane, Sompting. County architect, Chichester.

Whitley Bay.—Bungalows, Gorse Dene Road, for H. Turner; C. W. M. Potts, architect, 57, John Street, Sunderland.

Willenhall (STAFFS).—Fire station; U.D.C. surveyor, Town Hall.

Worcestershire. — Rheumatics' school, Blakedown, for C.C.; county architect, Worcester.

New Patents

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

35335. "Luminous electric discharge tubes." Scophony, Ltd., and H. P. Barasch. December 21st, 1937. (512833.)

1938

3630. "Prepayment meter mechanism." R. C. Graseby. February 4th, 1938. (512931.)

5070. "Gas or vapour filled electric discharge tubes." K. Neimanis. February 18th, 1938. (512885.)

5286. "Cathode-ray tubes." F. W. Cackett. (Telefunken Ges. für Drahtlose Telegraphie.) February 19th, 1938. (512933.)

5599. Electric transformer tank with cooling radiator." H. G. Binder. February 22nd, 1938. (512887.)

6312. "Electric motor control systems." British Thomson-Houston Co., Ltd., and J. P. B. Mourant." February 28th, 1938. (512938.)

6742. "Control gear for electric motors." T. W. Alexander, and Metropolitan-Vickers Electrical Co., Ltd. March 3rd, 1938. (512784.)

7847. "Sealing of metal wire or foil into vitreous material." Siemens Electric Lamps and Supplies, Ltd., J. N. Aldington and A. J. Meadowcroft. March 14th, 1938. (512941.)

7900. "Method of and apparatus for comparing the peak factors of alternating currents and voltages." Elliott Bros. (London), Ltd., and G. F. Shotter. March 14th, 1938. (512787.)

7922. "Three-phase electric transformer and/or choking-coil arrangements." Siemens-Schuckertwerke Akt.-Ges. June 5th, 1937. (512788.)

7923. "Control of the harmonics in polyphase alternating-current systems." Siemens-Schuckertwerke Akt.-Ges. January 8th, 1938. (512789.)

8013. "Electric organs." General Electric Co., Ltd., and A. J. Biggs. March 15th, 1938. (512943.)

8018. "Gas-filled incandescent electric lamps." Soc. Anon pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude, Paz et Silva. January 27th, 1938. (512791.)

8023. "Railway signal and/or points control systems." Standard Telephones and Cables, Ltd., J. B. Griffiths, and A. Brown. March 15th, 1938. (512895.)

8024. "Radio receivers, transmitters, and other arrangements comprising thermionic valves." Standard Telephones and Cables, Ltd., and C. W. Earp. March 15th, 1938. (512792.)

8025. "Railway indicators." Standard Telephones and Cables, Ltd., E. J. Tervet, and H. T. J. Walsh. March 15th, 1938. (512793.)

8034. "Methods of synchronising oscillation generators." Baird Television, Ltd., and D. V. Ridgeway. March 15th, 1938. (512795.)

8035. "Magnetic direction indicators." Siemens Apparate und Maschinen Ges. March 15th, 1937. (Cognate application 3036/38.) (512796.)

8166. "Double-walled electric lamps." Soc. Anon. pour les Applications de l'Electricite et des Gas Rares Etablissements Claude, Paz and Silva. January 28th, 1938. (512803.)

8283. "Electric switches suitable for operation by the passage of road vehicles." Automatic Telephone and Electric Co., Ltd., S. R. Smith, and J. H. Ellis. March 17th, 1938. (512836.)

8286. "Electrical control systems." C. J. Tagliabue Manufacturing Co. March 19th, 1937. (512984.)

8397. "Light-modulating devices." Scophony, Ltd., J. Sieger, and R. E. Duggan. March 18th, 1938. (512985.)

8398. "Television transmiters." Scophony, Ltd., and A. H. Rosenthal. March 18th, 1938. (512903.)

8457. "Electric current convertors." Siemens-Schuckertwerke Akt.-Ges. March 18th, 1937. (512906.)

8492. "Electric lighting units for industrial, street, or general lighting purposes." Revo Electric Co., Ltd., and F. H. Reeves. March 19th, 1938. (512908.)

8515. "Electro-magnetic devices." H. List. March 19th, 1938. (512910.)

8609. "Convertible light reflector or shade." C. D. Skinner, A. E. Iliffe, and Benjamin Electric, Ltd. March 21st, 1938. (512913.)

8762. "Television and like systems." Baird Television, Ltd., and J. L. Baird. March 22nd, 1938. (512855.)

8776. "Methods and apparatus for making metallic sheets by electro-deposition." E. O. Norris, Inc. October 14th, 1937. (512857.)

8793. "Electric motors." Siemens-Schuckertwerke Akt.-Ges. March 22nd, 1937. (512860.)

8918/8919/8920. "Vehicle head lamps." British Thomson-Houston Co., Ltd. March 23rd, 1937. (512955/512988/512956.)

8921. "Electric induction apparatus." British Thomson-Houston Co., Ltd. March 23rd, 1937. (512957.)

8975. "Electrically heated utensils." Premier Electric Heaters, Ltd., G. H. Collins, and H. T. Taylor. March 23rd, 1938. (512958.)

8997. "Electric circuits of motor vehicles." E. G. Lacey. April 7th, 1937. (Cognate application, 8998/38. (512959.)

9337. "Electric air-space-insulated lines or cables." Siemens and Halske Akt.-Ges. April 13th, 1937. (512968.)

9436. "Electron-discharge devices and circuits therefor." Marconi's Wireless Telegraph Co., Ltd. March 27th, 1937. (512995.)

9438. "Treatment of carbonised metal." Marconi's Wireless Telegraph Co., Ltd., March 27th, 1937. (512996.)

9463. "Television and like systems." Baird Television, Ltd. (Fernseh Akt.-Ges.) March 28th, 1938. (512999.)

9497. "Magneto generators." Bendix Aviation Corporation. March 30th, 1937. (513000.)

9581. "Telephone systems." J. E. Pollak (Associated Electric Laboratories, Inc.). March 29th, 1938. (512008.)

9595. "Teleprinter exchange systems." Standard Telephones and Cables, Ltd., and G. A. M. Hyde. March 29th, 1938. (513011.)

9779. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd. March 30th, 1937. (513019.)

9783. "Television." Marconi's Wireless Telegraph Co., Ltd. March 30th, 1937. (513021.)

12131. "Hermetic seals between metal and vitreous material." Siemens Electric Lamps and Supplies, Ltd., J. N. Aldington and A. J. Meadowcroft. April 22nd, 1938. (512974.)

18696. "Electrical apparatus for indicating liquid-levels." Evershed and Vignoles, Ltd., and W. T. Marchment. June 23rd, 1938. (512975.)

1606. "Electric signalling systems." Standard Telephones and Cables, Ltd., and E. P. G. Wright. February 22nd, 1938. (Divided out of 511695.) (512827.)

1760. "Gas-tight seals wherein electric conductors pass through quartz or like vitreous material." General Electric Co., Ltd., and K. G. Schnetzler. March 23rd, 1938. (Divided out of 512257.) Cognate application, 2022/39. (513025.)